

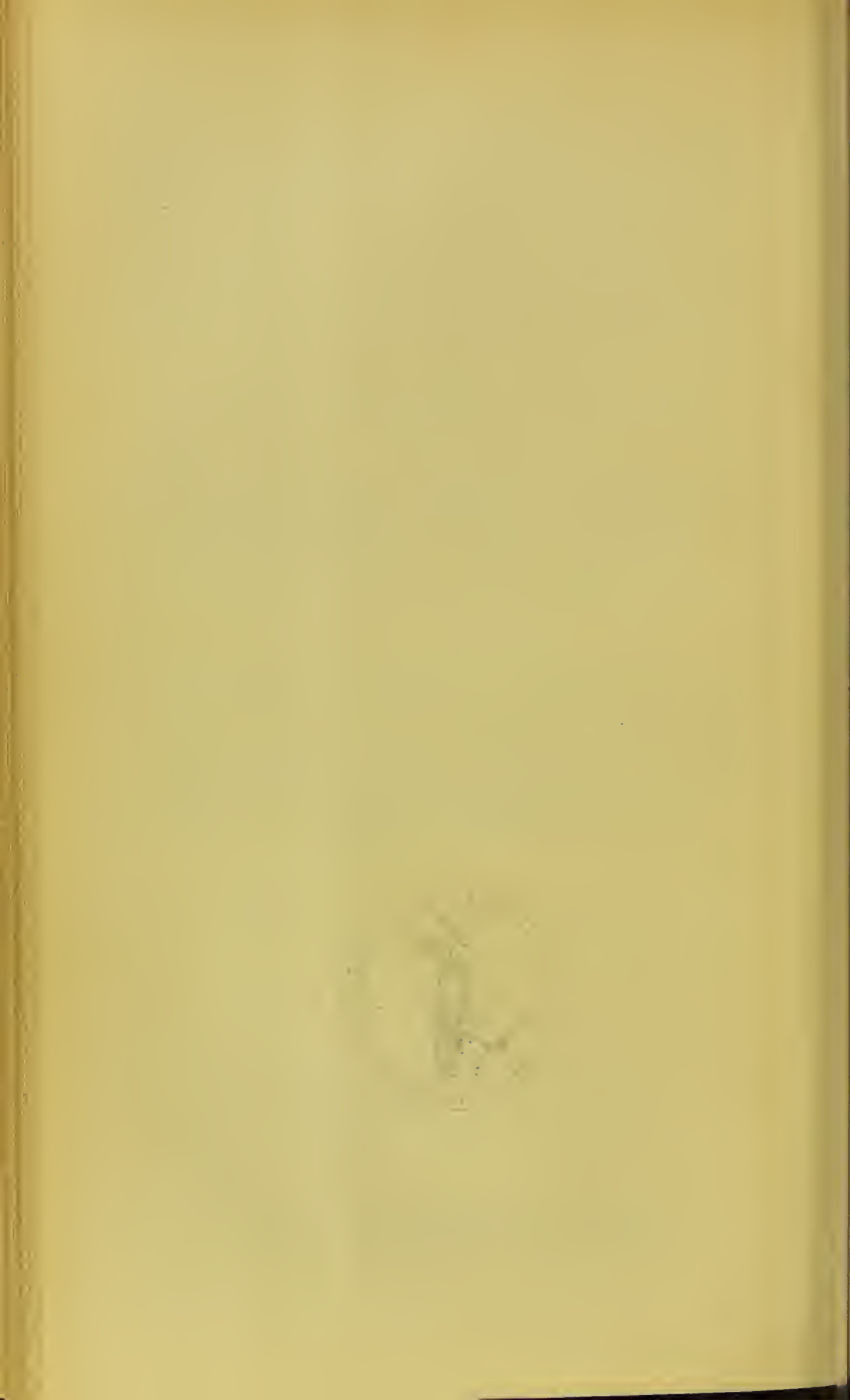
CONSERVATIVE SURGERY.



"Legant prius et postea despiciant ne videantur, non ex judicio, sed ex odii præsumptione ignorata damnare."—LOPE DE VEGA.

"Si quid novisti rectius istis Candidus imperti, si non his utere mecum."—HORACE.

"The skilful surgeon wounds to save."



ORIGINAL CONTRIBUTIONS

TO THE

PRACTICE OF CONSERVATIVE SURGERY;

BEING A SELECTION FROM THE SURGICAL CASES OCCURRING IN

THE PRACTICE OF

JAMES G. BEANEY, M.R.C.S.E.,

FORMERLY SURGEON TO THIRD ROYAL LANCASHIRE REGIMENT IN THE
MEDITERRANEAN, AND SURGEON TO HER MAJESTY'S HOSPITALS
IN GARRISON DURING THE CRIMEAN WAR.

MEMBER OF THE MEDICAL, THE MICROSCOPICAL, AND THE PHILOSOPHICAL SOCIETIES
OF VICTORIA, &C. ETC.



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TO JAMES SYME, ESQ., F.R.S.E.,

*Regius Professor of Clinical Surgery in the University
of Edinburgh.*

DEAR SIR,

I beg respectfully to dedicate to you this, the first medical book produced in these colonies, in grateful recognition of that teaching which, as a pupil, it was my privilege to receive from you, and of the ability, experience, and philanthropy with which you have laboured to demonstrate that the sufferings of humanity can be mitigated by conservatism in the practice of surgery, and, in so doing, opened up a path, in which, as a practitioner, it has been my endeavour to follow.

I am,

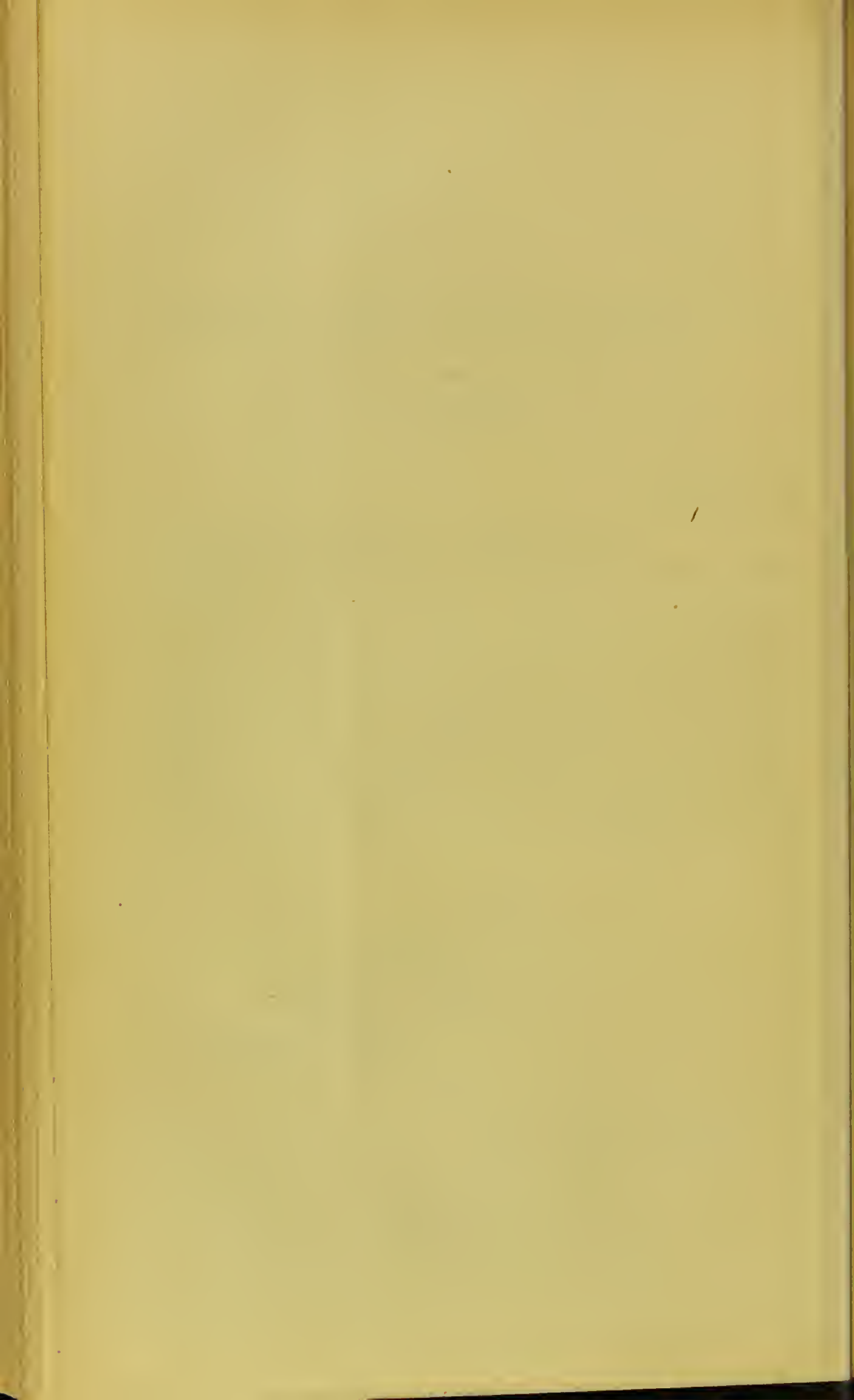
DEAR SIR,

Yours gratefully and faithfully,

JAMES G. BEANEY.

122 COLLINS STREET EAST,

Melbourne, November, 1859.



P R E F A C E .

THE present being the first work of the kind which has appeared in these colonies, some observations may be necessary, by way of reason, explanation, or apology, for the obtrusion of such a work, either on the medical profession or the general public. To the former I chiefly address myself on this occasion, and commend to their consideration this volume; in publishing which, my desire is to subserve and advance the cause of Conservative Surgery, by communicating such cases of it as came under my own personal observation in the course of practice. My hope is, not only that this work may be found useful, but that others of my professional brethren in these colonies may be induced to give to the world the results of their experience. The field of private practice is in itself considerable; but when, in addition to this, we have such an institution as the Melbourne Hospital, which should confer on the bulk of the profession that knowledge only attainable by well-directed observation within its walls, surely it is not too much to expect that this colony will yet contribute many bright pages to the history of our noble art.

I need not here dilate upon the benefit of chloroformization to the conservative surgeon, as that subject will be found sufficiently ventilated in the following pages. But I may venture to hope, that the action of the anæsthetic will be better understood; its importance more fully recognised; and an unfounded dread of it, which extensively exists, removed; at the same time, I cannot too strongly remind operative surgeons not to place so important an agent in the hands of incompetent persons, especially in cases which are necessarily of a tedious character. The operator cannot pursue his task with confidence, and devoid of anxiety, whilst the patient is exposed to imminent and deadly peril.

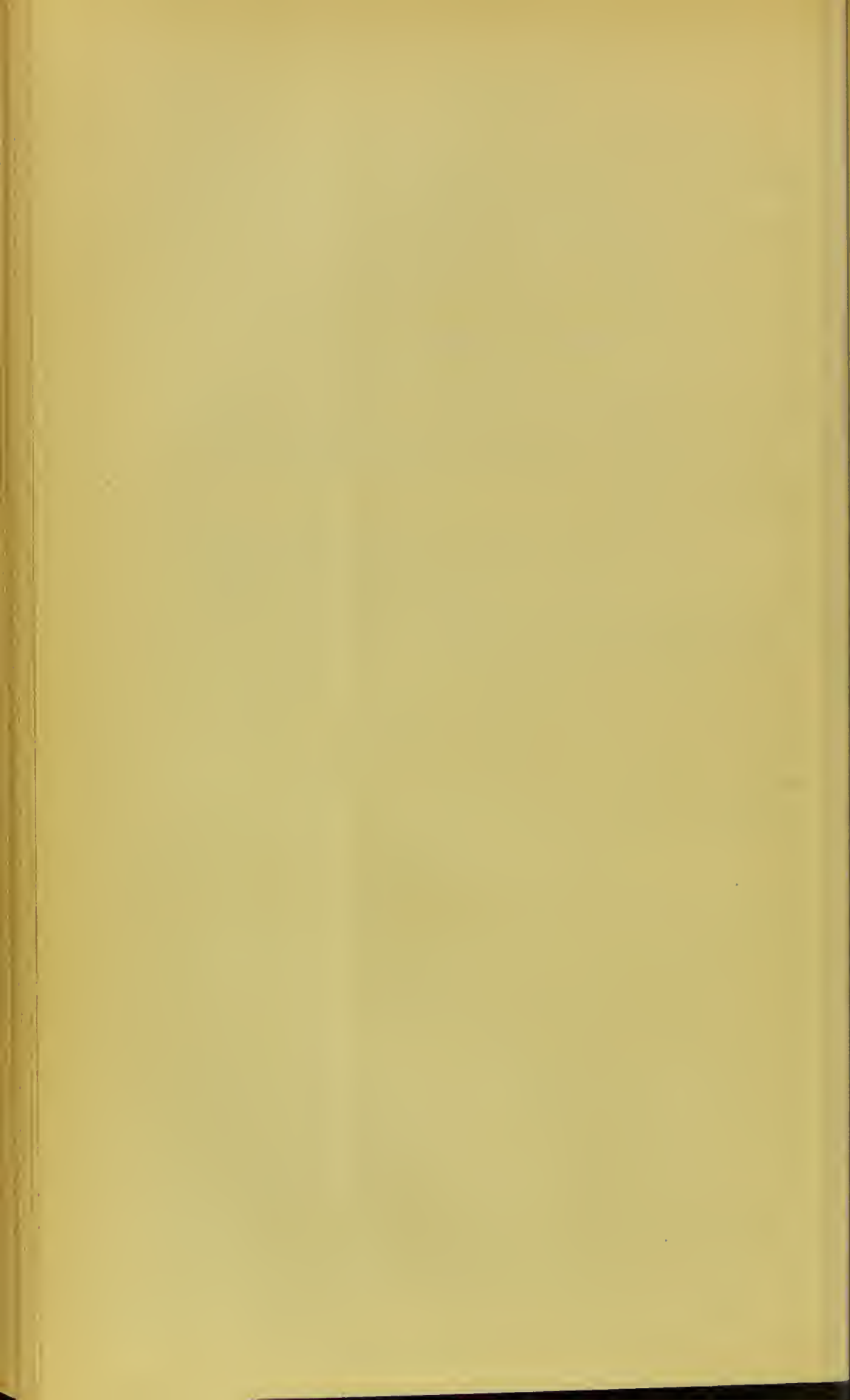
The art of surgery cannot be safely practised without the diagnostic skill supposed especially to pertain to the physician. In the case of exsection of the hip-joint, an operation had previously been deprecated, on the ground of utter inutility, owing to the *advanced tuberculization of the lungs*. No physical examination, that I could make, enabled me to detect the slightest trace of tubercular deposit; and the subsequent history of the case falsified the prediction.

I may also specially call attention to the case of hydrarthrosis, and the pious horror that has so long pervaded British and Continental surgeons, with respect to penetrating the cavity of the knee-joint, and exciting inflammation therein by the injection of an irritant. This long established prejudice, I trust, will now be dissipated by the light that modern science has thrown upon the pathology of joints, their curative indications, and their *modus operandi*. I have also, I trust, satisfactorily demonstrated the nature of *caries*, and its incurability by any treatment, local or constitutional.

Anæsthesia enables us to remove the whole of the diseased portions of bony structure, however deep-seated, difficult, or protracted, the operation. The adoption of any means for the cure of neuralgia of the epididymis, and its successful application, needs no further recommendation when contrasted with the horrible alternative of castration, hitherto in vogue. I have not descanted on topical anæsthesia, reserving the subject for illustration in another volume, should this obtain the approval and commendation of my professional brethren.

I trust to be enabled to present my next "contributions" with less of the crudities that must pertain to a maiden effort at authorship, amidst the distractions of active practice and the importunities of a publisher.

J. G. B.



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CHAPTER I.

DISEASE OF THE HIP JOINT:—SYMPTOMS, PATHOLOGY, AND TREATMENT—EXCISION.

Improvements in surgery—Conservative surgery—Mr. White's operation—Error of Velpeau—Revived by Professor Fergusson—Surgery in the Crimea—Morbus coxae, its connection with serofula—Hereditary—First excision of hip joint in Australia; Case, Symptoms when consulted—Antecedent history—Mr. O'Reilly's opinion—Error in diagnosis—Correct opinion of Dr. Brownless—Treatment—Dislocation—Suppuration—My own examination; Sinuses, Treatment—Diet and regimen—Medicamenta—Improvement—Diet and regimen—Medicamenta—Extension—Anæsthesia—Opening sinuses—Diet and regimen—Improvement—Relapse—Caries of head, neck, and shaft of femur—Excision advised—Cause of delay—Chloroform—Operation—Incision—Site of the head of the femur—Bone sawn through—Re-sawn—Acetabulum, healthy—Moribund—Improvement—Result—Symptoms—Alteration in position, length, and shape—Cause of pain—Shape—Obliquity of pelvis—Apparent elongation—Symptoms in first stage—True shortening—What arising from—Pathological anatomy—Vogel—Pathological chemistry—Valentin and Von Bibra—Morbus coxae, a disease of childhood—Exciting causes—Diagnosis—Treatment.

MANY improvements have taken place of late years in the practice of surgery, none of which occupy a more prominent position than those connected with operations on bones, and the excision of joints. It is comparatively but a recent period since the surgeon considered that the sacrifice of an entire limb was both justifiable and essential, to remove the diseased part, and thereby save life;

whilst the patient was equally satisfied. But fortunately for the surgeon, as well as those that are afflicted and require his aid, the science of surgery has discovered that the conservation of life and health is compatible with less extensive mutilations. Conservative surgery has stepped in, and demonstrated that the removal of the diseased portions of a limb is all that is essential to a successful issue, in necrosed tibia, and caries of the joints. The shoulder, elbow, ankle, knee, have each been successfully subjected to resection of the bones entering into the formation of these joints; and Mr. Anthony White, of the Westminster Hospital, was the first British surgeon who resorted to resection of the head of the thigh bone in analogous disease of the hip joint, although Velpeau and others have erroneously attributed it to Mr. White of Manchester. Notwithstanding Mr. White's success, the operation fell into desuetude, until Professor Fergusson, of King's College, London, revived it, I think, in 1845. His patient was a boy 14 years of age, who was rescued from death, regained health and strength, and had a useful limb restored to him. It is not alone in disease of the hip joint that this operation applies; but my military experience of surgery during the late

Crimean war, shows its inestimable value in injuries and gun-shot wounds. I have now, however, only to treat of the “*morbus coxæ*”—that chronic disease to which the hip joint is exceedingly liable, and which is associated with a morbid state of the system, often inherited, viz., the scrofulous, or strumous cachexia. In fact, the “*morbus coxæ*” is a mere incident, though so characteristic and important an incident, that it is usually and not improperly considered as a distinct affection,—*per se*—and apart from other joint diseases; although, like them, it may be of an acute, sub-acute, or chronic inflammatory character, with the almost unvarying concomitant of the strumous cachexia. An interesting case of this disease recently presented itself to me, and advanced so far as to eventuate the operation to which I have referred,—and which I relate, as being the first performed in these colonies. On the 24th July, 1858, I visited Miss T., æt. 12 years, and found her in a state of extreme prostration, with a small, quick, pulse, and loaded tongue, suffering from excessive thirst, and diarrhœa of several days duration. She was of scrofulous diathesis, hereditarily entailed—her mother having died of phthisis. The antecedent history was to the effect that, she had been in good health until

some eighteen months before, when she complained of pain about the left hip joint, especially when she twisted the leg of that side,—or the corresponding toes accidentally came in contact with any obstacle. There was no obvious constitutional disturbance until some seven or eight weeks after, when she exhibited decided lameness, and complained of feeling so ill, as to necessitate consulting a medical practitioner. The late Mr. O'Reilly visited her, but did not seem to attach any importance to the symptoms, ascribing them to “growing pains.” The pains, however, increasing, another professional opinion was sought, and she was seen by Dr. Brownless,—who at once recognised the nature of the disease; enjoined absolute rest; placed the limb on a well-padded splint; and prescribed alterative and tonic medicines. This treatment was pursued for some time, until a large abscess opened spontaneously, immediately over the trochanter major, and dislocation of the head of the femur, on the dorsum ilii, occurred. The splint was then removed, and she had remained for a considerable period in this condition, when I was consulted. The examination of the diseased hip joint, which excited great pain, showed three sinuses running round it in different directions; from

each of these, unhealthy-looking pus was freely discharging. Through two of the openings a probe passed readily into the joint, but it traversed the third downwards and backwards, close to the shaft of the femur, for three and a-half inches, whilst the affected limb was two and a-half inches shorter than its fellow. Having placed it on a pillow, I ordered warm water dressing, a farinaceous diet with a little wine, and prescribed,—

R Ammon. Sesq. carb ℥ij.

Tinct. Hyoscyam ʒi.

Syr. Aurantii ʒi.

Spt. Æther Nit. ʒvi.

Mist. Camphoræ ad ʒvj.

Capiat cochl i. mag. tertia quaque hora; and the following powders:—

R Hyd. c. Creta gr. ij.

Pulv. Ipecac. Co.

— Rhei āā gr. iij. omni nocte h. s.

This treatment was continued several days with such marked benefit that the diarrhœa ceased; she slept better, and was more cheerful. I now increased the quantity of wine, and allowed beef tea and chicken broth, supplemented by,—

R Salicine.

Quinæ Sulphat. āā gr. xij.

Tinct. Hyoscyam ʒi.

Syr. Aurantii ʒi.

Aquæ ad ʒvi.

M. fiat Mist. Capiat cochl i. mag. ter quotidie, with
Pulv. Rhei.

— Jalapæ āā gr. i
Sodæ Bicarb. gr. ij. omni mane.

Improvement still happily continued; indeed, so much so, that on the 9th August, finding it gave little or no pain to move the leg, I applied extension gradually, with the view of placing it as nearly as possible in its normal position. This was accomplished by means of a laced bandage, applied above the knee, from which straps were attached to a foot-piece and screw; thus it was brought down, without pain, until it was about three-fourths of an inch shorter than the sound limb. Premising that the disease might only be confined to the cartilages, I placed her under the anæsthetic influence of chloroform, freely opened two of the sinuses, and stuffed the wounds with lint. A copious discharge ensued, and the tents were withdrawn and replaced night and morning. From the 12th of August, she was allowed fresh meat, fish, fowl, eggs, ale, and wine; a regimen under which she improved astonishingly, gained flesh rapidly, and slept well. September 10th.—There was only a small quantity of laudable pus discharging, and the tent was withdrawn. The deep sinus posteriorly had healed so far that the probe only passed to the

depth of one and a-half inches. It was occasionally injected with a weak solution of sulphate of zinc. So, she progressed satisfactorily, until the 24th September, when swelling and tenderness of the affected parts supervened, for which warm fomentations and saline aperients were prescribed. The tumefaction increased until the 26th, when, on flexing the thigh, a quantity of sanio-purulent fluid flowed from the posterior sinus. On the 28th, the swelling had extended to the front of the joint, and down the shaft of the femur, accompanied by intense pain in the course of the obturator nerve, and irritative fever. These untoward symptoms appearing, after the sinuses were nearly closed, evinced that the head and neck of the femur were in a state of caries, and that the disease had pervaded and was extending down the shaft of the bone. Excision was the alternative I suggested, to save life and limb; but, as several relatives and friends required to be consulted, the operation was delayed until the 6th of October, when I performed it, assisted by my friends Drs. Knaggs and Robertson. When the anæsthetic influence of chloroform had been sufficiently induced, I made an incision five inches in length, commencing two inches above, and terminating three inches below the

trochanter major. This opening gave vent to a large quantity of ichorous-looking pus, which flowed from beneath the tensor vaginæ femoris. On fully exposing the articulation, the head of the femur was found in the cotyloid cavity, attached by recent adhesions. In dissecting it out, it broke off by the neck, presenting a vermiculated appearance, from ulceration and interstitial absorption. The diseased parts were now readily turned outwards, and the bone sawn through immediately below the trochanters. Two inches more, however, of the shaft of the femur required excision—in consequence of the softened condition of the bone and medullary canal—before the whole of the diseased mass was removed. The acetabulum was healthy, and very little blood was lost during the operation. The edges of the wound were brought together, a roller applied, the patient placed in bed, and a little wine and water administered. Next morning very little pain was complained of, but considerable nausea, the effects of the chloroform. The limb was placed on a well-padded splint, supported by sand bags, and water dressings applied. In the evening, however, I was summoned in great haste, as she was thought to be dying, the alarm being confirmed by constant vomiting, rapid and feeble pulse,

imperfect respiration, and cold extremities. Ordered hot bottles to the feet, brandy and water in small quantities frequently, and beef tea every hour. October 8th.—Vomiting nearly ceased, pulse fuller and more steady, extremities warm, had slept two hours. To take beef tea, arrowroot, and wine, instead of brandy. October 10th.—A free discharge of laudable pus, which gradually decreased from day to day. The wound did not heal for a considerable time, owing to small spiculæ of bone coming away occasionally. She is now in excellent health, and has re-commenced her studies, under a governess. She has considerable mobility of the joint, and is able to walk about with a high-heeled shoe, made for her by Jones, of Lonsdale-street.

We should be familiar with the symptoms of this disease, so as certainly to recognise it in its many phases—according to the form that it assumes. Alterations occur in the position, length, and shape of the affected limb, accompanied by pain. The seat of pain appears to be in the obturator nerve, the articular branch of which, being involved in the disease, communicates a radiating pain to the knee—from the extremity of its long descending branch being distributed there. Pain is increased by pressing over the pectineus, or

behind the great trochanters; also by standing, walking, or any attempt to bear on the joint, whilst abduction and rotation outwards still further aggravate it, as well as percussion. The shape of the limb is also characteristic, the nates flattened, the fold thereof in a great measure obliterated, and, if a female child, the vulva, on the affected side, is placed at a lower level. This arises from obliquity of the pelvis, the anterior superior spinous process of the ilium on the affected side being raised to a higher level than that on the sound one, thus also effecting an apparent shortening. This obliquity of the pelvis occurs very early, and is attributable to the child lifting its foot off the ground, to avoid pressing on it; in doing which, it is obliged to raise, not only the limb, but also the same side of the pelvis. After keeping the child, however, in bed a few days, this apparent shortening gives place to elongation; but it is also merely simulated, from the descent of the pelvis, on the affected side, below its natural level. We detect this apparent shortening or elongation by measurement, whilst the child is lying on its back. These then, viz., pain, the altered shape, and apparent lengthening of the diseased limb, necessarily cause a change from the ordinary position. The child limps, or walks

in a peculiar shuffling, half-hopping manner, standing only on one foot, and resting the toes of the affected side only on the ground, the knee being bent. On examining the leg then, it will be found everted, somewhat abducted, slightly bent on the thigh, the knee also partially flexed, and apparently shorter than the other. As the disease advances, abscesses form in the joint, most commonly under the glutæi, but, sometimes, at the anterior part, under the pectineus muscle. If the acetabulum happens to be involved, matter may form within the pelvis. True shortening now takes place, the limb at the same time being *abducted* and *inverted*; a very different position to that which it assumed during *apparent* shortening, in an earlier stage. This difference of position in the two stages, is due to muscular action. In the first, the strong *external rotators*, which are in close proximity to the joint, become irritated by the extension of inflammatory action, or from the pressure to which they are subjected by the distended capsule. Their increased action everts the limb, whilst at the same time it is slightly flexed and adducted, by irritation of the psoas and iliacus; as the disease advances, however, these muscles undergo fatty degeneration, by the formation of abscesses beneath and around

them: hence they are so atrophied, that they can no longer counterbalance the action of the *adductors*, so that the limb is drawn upwards and forwards, and turned inwards. True shortening of the limb arises from:—

1. Atrophy of member.
2. Absorption of head of bone.
3. Dislocation of head, on dorsum ilii.

The connection of hip-joint disease with scrofula is more strongly marked than that of most other affections of joints. In scrofulosis, depositions take place in various parts of the body, which exhibit, in different cases, great anatomical variations; being sometimes dense and firm, so that thin sections can be made; sometimes lardaceous; and at others, soft and crumbling, like curds. Its colour varies from transparency to a whitish, and even a yellowish tint. Histologically, it presents an amorphous stroma, molecular granules, and undefined cells, and cytoblasts, varying from the six-hundreth to three-hundreth of a line, occurring in very different portions, and mixed with fat globules. The granules consist of protein compounds, fat, and calcareous salts, which last disappear with effervescence on the addition of nitric acid. After

softening, the matter consists of indeterminate granular detritus. But, softening and ulceration does not always ensue, for in some instances the calcareous salts predominate, and the mass becomes a concretion. Histologically, scrofulous matter cannot be distinguished from tubercular or typhoid ; there occurs every intermediate grade between it and ordinary suppuration. The common termination of scrofulous matter is the softening of the deposited mass ; but the period which elapses between the deposit and the softening may vary from a few days or weeks to several months. These pseudoplasmata are but slightly or not at all organised, and, generally, their softening extends to the enclosed normal tissues. The united product opens for itself a passage, and is discharged externally, forming an ulcer, which either spreads by new deposition with softening, until it terminates in death ; or is healed by cicatrization ; whilst the loss of substance is repaired by permanently organised epigeneses. Such is the evidence furnished by the pathological anatomy of scrofulosis. Pathological chemistry has enabled us to draw some conclusions which may prove serviceable in treatment. The analysis of the matter in caries shows—

1. Marked decrease in the proportions of phosphate of lime.
2. An occasional slight increase in the carbonate of lime.
3. No change in the phosphate of magnesia and soluble salts.
4. Normal proportions of cartilage, the texture of which is altered.
5. A frequent and considerable increase of adipose matter.

In necrosis, analysis shows a slight diminution of cartilaginous substance, and an increase in the calcareous salts—the adipose matter remaining unchanged.

Morbus coxæ is, then, a scrofulous disease, whilst at the same time it is a disease of childhood, or early youth, almost invariably occurring before the age of puberty. Very slight causes seem to induce it, being usually attributed to over-walking, a sprain, or fall, or sitting in the wet. It may commence as an inflammatory affection of any of the structures of the joint, and it is difficult to prove in which it begins. The morbid action may be subdued, by appropriate treatment, without the articulation being destroyed, although it will be necessarily left in a somewhat rigid or anchylosed state. The

diagnosis of the disease is therefore of the utmost importance, and care must be taken not to confound it with—

1. Psoas abscess.
2. Chronic rheumatic arthritis.
3. Sciatica.
4. Lateral curvature.
5. Disease of knee.

The treatment of the disease must be conducted with reference to the acuteness of the attack, and the severity of the symptoms, local, and constitutional. The general health requires careful supervision; safety depends on the prevention of suppuration; but if abscesses form, they should be opened early, or otherwise the pent-up pus will only spread more widely the disorganisation of the soft tissues. Under the most favourable circumstances, when once the joint has been inflamed, the patient cannot use the limb with security for a year or two at least. After the formation of abscesses, the health speedily gives way; exhaustion, hectic, sinking ensue, from the wasting influence of the diseased bone, and the discharges it occasions; but still the sufferer may be snatched from death, retaining a useful limb, though permanently lame. During the operation there is very little bleeding;

no ligatures are required, but care must be taken not to injure the great sciatic nerve. The head and all the diseased shaft of the bone must be excised, the condition of the cotyloid cavity ascertained, and if the edges be found carious, removed by cutting-pliers; whilst if the deeper parts are involved, they should be taken away by the gouge. Subsequently, when the patient recovers, the shortness of the limb must be compensated by a high-heeled shoe.

CHAPTER II.

CHRONIC HYDRARTHROSIS.

Chronic hydrarthrosis—Its nature and treatment—Opinions of Jobert, Velpeau, Bonnett, and McDonnell—Exemption and capability—Operation the same as for hydrocele—British surgeons—Case—Patient's occupation, age, stature, and appearance—Original attack—Its nature—Sequela—Treatment—Van Hemert—Supervention of dysentery—Its effect—Return of dropsy—Treatment—Operation advised—Reason for demurring—Van Hemert's denunciation—Endorsed by Howitt—Mr. Gillbee's panacea—Reconsultation—Examination—Condition of swelling, and of limb—Operation again recommended—Assent—Removal—Operation—Anæsthesia—Quantity and character of fluid withdrawn—Injection—Manipulation—Subsequent position and treatment—Anodyne—Refrigerants—Improvement—Starched bandage—Cured in four weeks—Hydrops—The consequence of—Exciting causes—A disease of adult life—Joint most frequently affected—Character of swelling—Bonnet's description—Diagnosis—Pathology—Fibrinous dropsy—Histology—Vogel—Becquerel and Rodier—Essential knowledge—Physiology—Pathology—Gay's treatment of suppuration in joints—Velpeau and Cabaret—Rules during and subsequent to operation.

CHRONIC HYDRARTHROSIS—or that accumulation of fluid in the synovial sac constituting a true hydrops or dropsy of the joint—usually presents itself to the surgeon, to undergo routine treatment productive of no benefit to the patient. Yet Jobert and Velpeau, in Paris; Bonnet, in Lyons; and McDonnell, in Montreal; have demonstrated that we possess a very powerful means of treating the

disease,—not only exempt from serious consequences, but capable of effecting a radical cure. This consists in tapping the joint with a small trocar and canula, and, on withdrawal of the contained fluid, injecting a solution of iodine, a repetition of the process constantly practised for the cure of hydrocele and of synovial bursæ. But, however much *éclat*, it may have gained amongst French and Canadian, it has met with no favour amongst British surgeons, and it is certainly only now that it finds a place in the annals of Australian surgery. I present a case for the consideration of my colonial confrères.

In March, 1859—the present year—I was consulted by J. H., Esq., a gentleman residing at East Brighton, for a swelling of the right knee. He was a contractor by occupation, 38 years of age, of medium stature, and a spare though muscular figure. He had been in the colony during the last four years, and enjoyed very good health, until about eighteen months previously. He was then prostrated by a severe attack of acute articular rheumatism, with the pathognomic symptoms of inflammatory fever, and pains and inflammation of the larger joints, the stress of the disorder falling principally on the right knee; about the end of

the second week he was sufficiently recovered to be pronounced convalescent, although some swelling remained in the knee that had been most severely implicated, and also pain on flexing the joint. Rubefacients and a bandage were employed, but the tumescence and pain increased. Mr. ——— was consulted, and this gentleman enjoined rest, and painted the surface of the joint with tincture of iodine. Immediately subsequent to this a severe attack of dysentery occurred to Mr. H., on recovering from which the swelling had disappeared, and he was enabled to resume his usual avocations, which were of a remarkably active character. But this disappearance of effused fluid was delusive. It returned, and was in due course and rotation subjected to strapping, iodine, bandaging, blistering—*et id hoc genus omne*—an “omnium gatherum” of irritating applications. Such being the antecedent history of the case, and aware that he was still under treatment, I at once advised paracentesis and the injection of iodine; to this, however, he demurred, until, at all events, he had consulted his usual medical adviser as to the propriety of such an operation. This resulted in that gentleman denouncing it as “rash and unsurgical,” and that it would terminate with the loss of his leg at least,

but probably, also with the forfeiture of his life. Dr. — was next consulted, and fully endorsed Mr. —'s terrible denunciation. Recourse was then had to Mr. —. He pursued the ordinary ineffective routine, but finding it unavailing, supplemented it by the *cabala*—"rest, peace of mind, and warm weather."

On the 15th of June, Mr. H. revisited me as a dernier resort. "Abandon hope all ye who enter here," seemed to him blazoned on the threshold of every consulting-room he sought,—he was "au desespoir." An examination of his knee showed that it was still very much enlarged, both above and below the patella. The swelling was of a globular form, soft, fluctuating, and most considerable on the inner side of the joint, whilst the contained fluid readily passed upwards, when pressed from below the patella, and in the same manner from side to side. The leg and thigh of the affected joint were very much wasted, and so weak that he could scarcely walk. I repeated the advice I had previously given him, namely, to be operated on, to which he at once assented; and in furtherance of which, removed from Brighton to Melbourne. The 22nd of June, at three p.m., was appointed for the operation, for which he was now

not only solicitous but very sanguine as to the result. My first care on arrival was the temperature of the room—78° Fah. My next, to concentrate the fluid by a roller below and above the joint, with the view of rendering the tumour more tense and projecting. Dr. Bowman then placed him under the influence of chloroform (his experience with it being very considerable, and was the first, I believe, who employed it in London: vide *Lancet*, 1847). As soon as my patient was sufficiently anæsthetized, I introduced the trochar into the most prominent part of the swelling; on its withdrawal, ten ounces escaped through the canula, of a fluid, which gelatinized on cooling. I then injected the joint, or rather, the sac, with three drachms of the tincture of iodine of the London Pharmacopæia, diluted with an equal proportion of warm water, and well manipulated the limb, so as to bring the iodine in contact with every portion of the sac. Mr. H. was then placed in bed, a wet bandage applied from the foot, and carried above the knee, and the leg placed on a well padded M'Intyre's splint. That part of the bandage around the joint was directed to be kept constantly wet with cold water. Nine p.m., the knee is much swollen, hot, and painful, skin hot

and dry, great thirst, pulse 94, and full, ordered the following—

R Sol. Morphiae Hydrochloratis ʒi.

Spt. Æther Nit. ʒij.

Misturæ Camphoræ ad. ʒij. M. fiat haust. stat;
and to apply constantly to the part affected the following
excellent refrigerant lotion :—

R Spt. Vini. Rect. ʒij.

Eau de Cologne ʒij.

Aquæ ʒxvi.

M. fiat Lotio.

June 23rd, a.m.—Has passed a very restless night;
knee much swollen; pulse 96, hard; tongue dry;
great thirst. I ordered—

R Liquor Ammon. Acet. ʒij.

Tinct. Hyoscyami ʒij.

Spt. Æther Nit. ʒvi.

Syr. Aurant ʒi.

Aquæ Flor. Aurantii ad ʒviij.

M. fiat Mist. Capiat ʒi., tertia quaque hora ex aquæ.

P.M.—Knee easier; pulse 104; skin moist; thirst
diminished; tongue moist and cleaning; very
cheerful. To continue mixture and lotion, have
farinaceous diet—lemonade and barley, or toast
water, ad libitum.

June 24th, a.m.—Has slept well; knee less
swollen; pain decreased; pulse 98, full and soft;
tongue clean; skin moist. From this time the
pain subsided, and the swelling gradually dis-

appeared. The pulse became normal; he slept well, and enjoyed his food. On the eighth day after the operation, the splint was removed, and the wet bandage superseded by a starched one. At the end of the second week he left his bed; during the third, he was enabled to walk; and the fourth witnessed his return to Brighton. Since that period he has continued well, and been actively employed in his usual avocations.

HYDROPS ARTICULI, HYDRARTHUS, or HYDRARTHROSIS, is the consequence of chronic inflammation of the synovial membrane, and this perhaps the sequel of an acute attack. It arises from many local causes, as blows, strains, and mechanical injuries; or, it may be generated *constitutionally*, by exposure to cold—by rheumatism or gout—the abuse of mercury—or by the gonorrhœal or syphilitic poison. It is a disease of adult life; and the joint most frequently affected is the knee. When the knee-joint is affected, it is characterized by a peculiar distinctive swelling, which alters the shape of the joint, and is most prominent where the joint is least covered by ligament. The patella is protruded forward; there is great fulness at either side of it, and at the lower and front part of the thigh. It has, in fact, what Mr. Bonnett describes so

graphically—a bosselé appearance. This swelling is associated with a dull aching pain, (which is not, however, increased by pressing the articular surfaces together). And there is also a feeling of great weakness, and relaxation. Now, this is the disease for which we recommend the operation of puncture, and injection, viz. :—*chronic uncomplicated dropsy of the knee-joint*. It is not to be confounded with the disease described by Sir Benjamin Brodie as “pulpy degeneration of the synovial membrane,” nor with “white swelling.” It is a dropsy which, in the case I have adduced, was of the fibrinous character, that is, distinguished from serous dropsy, by the effusion containing dissolved fibrin. When this fluid is examined immediately after its discharge, it resembles serous dropsy, being either perfectly clear and colourless, more or less turbid, opalescent, or of a greenish yellow colour. Placed under the microscope, it displays no solid particles; after some time, however, the whole of the fluid generally coagulates, and forms a homogeneous, tremulous jelly, which, subsequently separates into a partially consistent, colourless, or yellowish red clot, and a clear yellow fluid. In chemical composition, it is identical with the plasma of the blood, independently of its corpuscles. This identity sometimes

extends even to the quantitative composition. The clot is coagulated fibrin; for, on washing it with water, and pressing it between folds of fine linen, a small quantity of tolerably firm stringy fibrin can be obtained. The fluid is analogous to old serum of the blood. The diagnosis of fibrinous from serous dropsy, consists in the former containing dissolved fibrin, and spontaneously coagulating after its removal from the body. A clear and distinct knowledge of the morbid condition of a joint, which is the seat of a chronic synovial effusion, is absolutely essential, before we can treat it rationally. The dread so universally entertained of puncturing a joint, refers more to its normal or physiological state. Its pathological condition, however, ought more properly to be considered and studied. Then there would be no doubt as to the utility of injection in dropsy, or the propriety of incision in suppuration, as practised by Mr. Gay of London, and other surgeons. We have now sufficient proof that puncture and injection may be performed in hydrarthrosis, not only with propriety, but with complete success, in the same manner that a radical cure is effected in hydrocele. Injection is not to excite inflammation, but to modify the diseased secreting action, by procuring an irritation " which should be

constantly adhesive, and never purulent." The operation itself presents no difficulties:—

1. Bandage the leg from the foot upwards.
2. Puncture the sac with a small trocar and canula above the patella, where the tumour is most projecting, and withdraw the contained fluid.
3. Inject three drachms of tincture of iodine, diluted with an equal quantity of tepid water.
4. Manipulate the joint so as to bring the injected fluid in contact with the whole surface of the sac, and allow it to remain.
5. Close the opening, and apply a wet bandage from the foot to above the knee.
6. Place the limb straight on a well-padded splint, so as not to allow the slightest motion for at least a week.
7. If pain and swelling, with inflammatory fever, occur, treat it antiphlogistically.
8. When the patient is allowed to leave his bed, substitute a starched for the wet bandage.

This comprises the rational treatment of chronic hydrarthrosis, which has resisted all other methods. And I trust it will soon occupy its proper position in Australian Surgery. The treatment which has hitherto been adopted casts opprobrium on our noble art.

CHAPTER III.

OBSTRUCTION OF THE BOWELS, WITH TYMPANITES.

Insidious onset of the disease—Causes, sometimes trivial, often grave ; to wit: Functional derangements, atony, feculent accumulation, concretions, tumours, benign and malignant bands of lymph, adhesions, intussusception, twisting, strictures—Seats of strictures ; causes, and diagnosis—Subdivisions of colon—Tympa nites, its synonyms—Derivation, and causes of gaseous exhalation ; its probable composition — Judications of treatment—Removal of distension by mechanical means ; auxiliary remedies—Antecedent history of case, and condition presented—Examination “per anum” —Treatment—Progress of malady—Enemata—Consultation with Dr. Howitt—Projected operation arranged with Dr. Bowman, obviated by unanticipated result of asophageal tube—Golding Bird’s case—Bowman’s case, and Mr. Luke’s post-mortem diagnosis—Liability of mucous canals to stricture—Pathological changes in lining membrane at affected parts ; their causation—Object of an operation in stricture of the intestines, and importance of accurately determining its exact situation—Usual seats of stricture, and variations as to its extent, circularly and longitudinally—Age at which it occurs ; predominance as regards sex ; and tendency to occur in several members of the same family—Earliest symptoms—Effects of increasing contraction—Diagnosis by palpation, “per anum,” and with asophageal tube—Precautions, and errors to be avoided in employing this last means—Circumstances affecting the success of an operation—Operations originated by Littré and Callisen—Luke and Curling’s adaptations—Amussat’s method, and important step during its performance—Modifications of pilore—Benjamin Bell—Freer—Pruig—Cæsar Hawkins—Reasons for preference, and objections to lumbar and iliac openings—Cæsar Hawkins’s plug—Operation warrantable, on authorities of Thierry, Velpeau, Luke, Martland, Gay, Clement, Hawkins, Avery, Cock—Criterion of danger—Opening of other portions of intestinal canal.

CASES of obstruction of the bowels present an interesting field for inquiry, as regards their causes,

treatment, and results. Insidious in their onset, they may arise from a multiplicity of circumstances, some of which are trifling, and readily overcome by appropriate remedies; whilst others are so grave as to require surgical interference; and the rest are beyond the pale of any curative treatment whatever.

Obstruction of the bowels may arise from—

1. Functional derangements of the chylo-poietic viscera.

2. Atony of the muscular coat of the intestines.

3. An accumulation of impacted fœces.

4. Formation of solid concretions.

5. Tumours, benign, or malignant, projecting into the cavity of the bowels.

6. Organised bands across the bowels.—(DR. GOLDING BIRD.)

7. Adhesions of peritoneum.

8. Intussusception, or invagination.

9. Twisting of the bowels.

10. Organic tumours exterior to the bowels.

Lastly, 11. Permanent strictures, which may be induced by

a. Spasm, from inflammatory adhesions.

b. Thickening of the parietes of the bowel, and consequent diminution of its calibre.

c. Cancers.

- d.* Simple inflammatory hypertrophy of submucous cellular tissue.
- e.* Cicatrices,—the sequelæ of extensive ulceration.
- f.* Fatty depositions exterior to the bowel, and beneath its peritoneal covering.—(SYMONDS, TRAVERS.)

Permanent stricture may occur in the small, but most commonly in the course of the large, intestine, which is divided into the cœcum, colon, and rectum,—is five feet in length, and sacculated. The rectum, extending in length from seven to eight inches, is the usual seat of stricture, but not unfrequently it is found in the colon. The colon is subdivided into ascending, transverse, descending, and sigmoid flexure. This last is the narrowest part of the colon; curving, in the first place, upwards, then downwards, and to one or other side. It is retained “in situ” by a meso-colon.

The diagnosis, whether cases originating in functional derangement, or depending upon mechanical obstruction, is extremely difficult. The class of cases referable to the latter, proceed from such a variety of causes, as to embarrass both the prognosis and the treatment. In all, the symptoms are insidious in their approach; the most pro-

minent, and that which entails the greatest amount of suffering, being a tumid state of the abdomen—tympanites. This may occur suddenly, or may be preceded by unusual flatulency—borborygmus, and the frequent expulsion of air from either termination of the intestinal canal. At length, the abdomen becomes so distended, tense, and elastic, that it sounds like a drum on percussion. The retained air is in the stomach and intestines, chiefly in the arch and sigmoid flexure of the colon.* Gases of different kinds are always present in the stomach and bowels, thereby sustaining an equable distension of the abdominal cavity, under the constantly varying quantity of its liquid and solid contents. It is only when it accumulates inordinately, that it is considered a morbid phenomenon, and is distinguished by the synonyms of Tympanites, Emphysema abdominis, Hydrops siccus, &c.† Pathologically, it occurs from antecedent disorders, or dangerous organic changes; and although no analysis, as far as I am aware, has been made of it, it probably does not differ materially from that which is generated nor-

* In rare cases air passes into the peritoneal sac, from ulceration of the bowels.

† When occurring in typhoid fever, it is designated “meteorismus.”

mally. Acute, or malignant diseases, however, may produce important changes. Histology demonstrates, that it may be referred to

1. Extrication of air from the digestive mucous surface.

2. Deglutition of air with the food or saliva, in a small degree.

3. Decomposition, or fermentation of ingesta, secretions, and excretions.

The predisposing, exciting, concurring, or determining causes are

a. Obstruction, mechanical or otherwise, to the discharge of the gaseous exhalations.

b. Impaired contractile power of the muscular seat of the intestines.

c. Alterations in the state of the blood, from vital changes, or from matters absorbed. These alterations induce the absorption of gases from the air, or their generation, or extrication from the blood itself.*

d. Changes in the respiratory functions.

However tympanites may be produced, the signs and symptoms of its existence are very manifest by inspection, palpation, and percussion. The indications of treatment are

* Extreme instances occur chiefly after poisonous ingesta.

1. To remove distension.
2. To subdue the pathological conditions on which such distension depends.

These circumstances are always difficult, often hopeless. For the first indication, recourse has been had to various mechanical means:—

- a. Introducing enema-pipe into the rectum, to remove any resistance offered by the sphincter ani.—(DARWIN.)
- b. By the air-pump.—(TRUKA.)
- c. By a gum-elastic tube, nearly three feet in length, fitted with a button, and hole, at its extremity, to which a stomach-pump is applied, and the gas withdrawn.—(OSBORNE, GRAVES, COPLAND.)

These have been supplemented with enemata, fœtid and terebinthinate, frictions, bandages, *et multa aliorum*.

The foregoing observations prelude the history of a case, which is a fair type of the obstruction of the bowels from permanent stricture, and enormous tympanitic distension. On the 2nd May, 1859, I was summoned hastily to Mrs. S., a lady born in Tasmania, and 34 years of age. She had been married fourteen years, but without issue, was of temperate habits, and had suffered from severe

paroxysms of acute pain, in the left iliac region, during the last two years. These attacks are attended with vomiting, and rigors, followed by fever, and diaphoresis; soon after the occurrence of which, she recovers, and feels as well as before. She is subject to constipation, the bowels only acting at intervals of several days, whilst, occasionally, there is diarrhœa; suffers from indigestion, palpitation, and headache, and intense heat and itching of the anus. The condition which she presented was a physiognomical expression of acute suffering, accompanied by chills. The extremities were cold; tongue dry and clean; pulse 85, soft and full; bowels confined; the whole of the abdomen slightly tympanitic, but principally over the region of the descending colon. Pressure in the left iliac fossa, was exceedingly painful. An immense hæmorrhoidal mass surrounded the anus, communicating a feeling precisely similar to that of varicocele, from which she experienced great suffering in the act of defœcation. The catamenia were regular; appetite tolerably good; and cheerful in the intervals between the paroxysms. A careful examination of the rectum, by the finger and bougie, showed that no stricture existed in the terminal portion of the gut, and I resolved upon

anticipatory treatment. This consisted of mercurials, cathartics, narcotics, sedatives, antispasmodics, tonics, exhausting the pharmacopœia, but without effect. Her appetite failed; she grew pale; lost flesh, and ultimately became hectic. There was a feeling of weight and obstruction in the bowels; pain in the loins, the hips, and down the thighs, with irritability of the urinary organs, and "bearing down." The stomach sympathised; the functions of the liver and kidneys were deranged; the countenance became pale and sallow; circulation disturbed; respiration embarrassed, (from descent of diaphragm being impeded); and she was greatly distressed by flatulent distension of the abdomen. The only relief she had experienced was from the employment of enemata, composed of turpentine, castor oil, and tincture of opium. These were continued daily for fourteen days, with the good effect of bringing away considerable quantities of flatus; but after nine days a quantity was returned, and gradually their beneficial effects declined. On the 9th July, Dr. Howitt saw her with me in consultation, and, on his recommendation, galvanism was adopted, but did not relieve. On the 14th, I passed an œsophagus tube (which I had previously used without success)

to the extent of about thirteen inches, where it met with obstructions. Pressing steadily against this for some time, it at length yielded; the tube passed readily onward; the flatus audibly rushing through it, and made still further sensible by its fœtid odour. The abdomen rapidly fell; a binder was applied, and she continued to improve, under a tonic regimen and diet, until health was completely restored. The possibility of effecting the introduction of the œsophagus tube was so little anticipated, that I arranged with my friend, Dr. Bowman, to open the bowel above the strictured part, either by what is known as Aumssat's or Littre's operation,—or such modification of them as the circumstances of the case might require or suggest.

Operations have been required and performed for obstruction of the bowels, from mechanical causes, arising from a band of organised lymph, or stricture. The diagnosis is difficult. The late Dr. Golding Bird obtained great *éclat*, in a case that occurred in Guy's Hospital. He detected the seat of the constricted portion of bowel, by an organised band, and with such precision, that Mr. Cock cut down upon it, and released the bowel. Subsequently, when in attendance upon a case of obstruction with Dr. Bowman, a similar diagnosis

was made, and Mr. Luke was requested to operate. Before that gentleman's arrival, however, the attendants permitted the lady, who was very fat, to get out of bed. She had an attack of syncope, and died. Mr. Luke's examination of the body, and the symptoms detailed to him, predicated that on the "*sectio cadaveris*" the sigmoid flexure of the colon would be found—the seat of stricture, which was verified. The supposed seat of stricture was a sharp ridge of one of the sacculi of the ascending colon;—its real seat was in the sigmoid flexure.

All mucous canals are liable to stricture, or obstruction, from contraction of some portion of their walls. At the affected part, the mucous membrane is rarely healthy. On the contrary, it is generally red from capillary injection, extensively ulcerated, and discharging purulent matter. These changes are attributable to chronic inflammation of the mucous, and submucous areolar tissue, and when an operation is attempted, it is with a view to establish an artificial anus. It is of great importance to discriminate between strictures of the rectum, and those of the sigmoid flexure of the colon. The terms, "upper part of rectum," and "lower part of sigmoid flexure," have been indefinitely employed by different surgeons, to a track

of from five to fourteen inches from the anus, but the seat of the disease is, to a considerable extent, a clue to its nature, and tends to effect the success of the operation. For example, obstructions of the first five or six inches are mostly cancerous, or contracted cicatrices of former ulcers; but those which occur in the sigmoid flexure, are usually firm and hard, from induration of all the coats of the bowel, generally of an annular shape, but with no evidence of carcinoma. The usual seat of stricture is stated to be

Within two or three inches of the anus.—(BRODIE, SOUTH.)

Five or six inches from the anus.—(SALMON.)

About the termination of the colon.—(WHITE.)

It varies in extent; only one side of the intestine, or one fold of the mucous membrane, is affected; or it may be annular. Longitudinally, it may occupy a surface extending from a few lines, to several inches. It is generally met with from 25 to 60 years of age, although cases are on record occurring both earlier and later. Buske considers that it attacks both sexes nearly equally. Curling states that three-fourths predominate in women; and it is satisfactorily known that several members of a family have been affected by the disease. The

earliest symptoms of stricture are habitual constipation, defecation being difficult when the motions are solid, but the patient is readily relieved by such purgatives as are solvent. As the contraction increases, greater difficulty is experienced in overcoming the constipation, and it acquires a habit of straining to relieve the rectum of its contents.

The diagnosis may be determined with sufficient accuracy, for all practical purposes, by palpation, examining with the fingers, "per anum," and the œsophagus tube. Care must be taken to decide the exact situations the stricture occupies in the great intestine, and not to determine that it is in the colon or rectum, when it exists in the small;—because, an opening, in either case, below the obstruction, could not, by any possibility, relieve the patient. Another caution requisite is, that the surgeon should bear in mind, not to overlook the true cause of obstruction, on account of the presence, or supposed existence of a hernia. If the obstruction occurs at the lower part of the colon, or in the rectum, the whole of the colon will be distended, and palpation will sufficiently define its outline, unless the whole of the intestinal canal is equally distended, or there is much deposition of fat in the abdominal parietes. Should the stricture

be seated in the rectum, it may be detected by the fingers, or higher, by the aid of a bougie. In women, who have borne children, and in whom the pelvic structures are lax, there is no difficulty in introducing the hand into the rectum, and so making a further exploration with the finger. But if the obstruction exists in the sigmoid flexure, we have recourse to the œsophageal tube, in using which we must guard against its entanglement in the folds and flexures of the intestine. It also may be bent upon itself, by coming in contact with any obstacle, or against the promontory of the sacrum, and so give the idea of passing freely into the gut. Any error from such causes can, however, be readily obviated by introducing the finger into the anus.

The prognosis of a case of obstruction, with concomitant stricture of the bowel, depends on the degree of contraction, its position, condition, and the causes that have produced it. These circumstances materially affect the success of any operation for the formation of an artificial anus; and it is desirable to separate disease of the rectum, from that of the sigmoid flexure, inasmuch as obstructions of the first five or six inches upwards of the intestinal canal, are mostly cancerous, or contracted cicatrices of ulcers; whilst constrictions

of the sigmoid flexure, present a thickened condition of all the coats of the bowel, but seldom, if ever, furnish evidence of carcinoma.

There are two operations between which to choose, for the establishment of an artificial anus—to relieve obstruction at the lower part of the colon or rectum, when all other resources have failed.—The bowel may be opened through the anterior walls of the abdomen, as suggested by Littre in 1720, or in the lumbar region, as recommended by Callisen. The supposed advantage of the latter over the former, is obviating the necessity of dividing the peritoneum; neither of these operations, however, were performed by their projectors. Littre's operation was first successfully practiced by Dinet, in 1793, whilst Callisen's is only known to surgeons by the modification of Amussat. Instead of the original suggestion of Littre, I shall describe the operation as performed by Mr. Luke, of the London Hospital, in a case of stricture, where the œsophageal tube, traversed the bowel upwards, to the extent of twelve inches. He opened the abdominal parietes, near the groin, by a perpendicular incision, four inches long, and a little to the outside of the course of the epigastric artery. The lower extremity of this incision terminated a little

above Poupart's ligament. The abdominal muscles and fascia were then divided *seriatim*, until the peritoneum was exposed, when it was opened to an extent of about two inches,—not a greater amount of exposure than in operations for strangulated hernia. Through this, the distended colon was with difficulty obviated from protruding, by the hand. The stricture being recognised, the intestine was opened above it, by a longitudinal incision, an inch in length, prior to which a curved needle, armed with a silk ligature, was passed through the coats of the bowel, above and below, so as to secure it, and prevent its receding when emptied.

Some surgeons prefer that modification of Callisen's operation, adopted by Amussat, viz.—opening the descending colon in the left loin. The patient is placed on his face, with a pillow beneath the lower part of the abdomen, in order to render the left flank prominent.

The spot to be opened is about two fingers' breadths above the *crista ilii*, and midway between the anterior, superior, and anterior-inferior spinous processes of the ilium.

This situation being kept well in view, an incision is to be made transversely across the loin, commencing at the outer margin of the *erector spinæ*,

and carried outwards, to the extent of four or five inches. The layers of muscles are consecutively cut through, and, on reaching fascia transversalis, it is divided on a director; in the loose fat beneath this, the posterior wall of the colon will be found, which is to be seized by the forceps, drawn towards the outer wound, and an opening made into it in a longitudinal direction, not less than an inch in extent, the sides of which are to be secured to the edges of the wound in the skin, by two sutures, one on either side. This is a very important step in the operation, its object being—

1. To prevent fœcal effusion into the loose areolar tissue.
2. To render the intestinal opening superficial, instead of its being at the bottom of a deep wound.
3. To obviate any difficulty in afterwards keeping the aperture patent.

Various modifications of this operation of Amussat's have been practised by surgeons.—(PILORE, BENJAMIN BELL, FREER, PRINLY, CÆSAR HAWKINS.) When preferred to Littre's, it is chiefly on account of avoiding opening the peritoneum; but this lumbar opening has certain objections, which, in the minds of others, outweigh the risk of the peritoneal section.

1. In the event of an error of diagnosis, it does not provide facilities for correcting it.

2. In consequence of its position, the patient cannot conveniently attend to it himself.

3. On account of the depth of the wound, it has a tendency to contraction, which may occasionally block it up, and require renewed surgical interference.

4. It prevents the surgeon opening the colon so close to the seat of obstruction, as to preserve to the patient the utmost extent of intestinal canal, of which the case is susceptible.

To prevent contraction in the lumbar opening, an ivory plug is used, attached to a small brass plate, enclosed in india-rubber, and retained in opposition by an elastic bandage. This is removed for an hour or an hour and a-half in the morning, and then re-introduced. After Littre's operation, a truss is applied at the groin, to prevent fœcal escape.

The establishment of an artificial anus, by either of these operations, is perfectly warrantable in cases of obstruction of the bowels, caused by stricture in the lower part of the colon or rectum, which has resisted all other treatment, and immediately jeopardised the life of the patient,—not only warrant-

able, but it is the bounden duty of the surgeon to exercise such appliances of his art, even though they have miscarried in some skilful hands. The length of time during which *final* obstruction has existed, should not be the criterion of danger; but the frequency and urgency of previous attacks, and the severity of present symptoms. Success has been obtained after thirty, forty, forty-five, and even fifty days' constipation. Other parts of the intestinal canal have also been opened:—the transverse colon, between the umbilicus and pubis, the small intestine, and the cæcum. (THIERRY, VELPEAU, LUKE, MARTLAND, GAY, CLEMENT, HAWKINS, AVERY, and COCK.)

CHAPTER IV.

OBSTRUCTIVE DYSMENORRHŒA.

Distinctive character of dysmenorrhœa—divided into three species: Neuralgic, congestive or inflammatory, obstructive—Difficulty in emissio mensi—Condition of the canal of the cervix—Causes of occlusion; its seat, nature of suffering—Peculiarities of discharge—Ovaries—The nature of the disease must be distinguished by a physical examination of the uterus—Uterine sound—Means of diagnosing uterine affections—Facility of introduction of the uterine sound—Circumstances when impossible—Dr. Mackintosh, of Edinburgh, first to suspect that mechanical obstruction might produce dysmenorrhœa—His treatment—Success—Professor Simpson's alteration of bougies—Dilator—Description of permanent bougie—Its advantages—Lithotome caché—By whom subsequently adopted—Enumeration of means of cure—Beaney's trochar caché—Description of instrument—Its mode of application—Case—Dr. Seonce—Supposed ailment and consequent treatment—Antecedents—Age of patient—Duration of married life—Origin of malady; its effects, local and constitutional—State of patient at time of consultation—Symptoms—External examination—"The touch"—Speculum—Uterine sound—Advise operation—Hæmorrhage—"Gentian tent"—Advantages—Sponge tents—General treatment—Condition of patient at end of four months.

THE distinctive character of dysmenorrhœa is severe pain accompanying the secretion or emission of the menstrual fluid, which may be scanty, profuse, or in the usual quantity. The pain also varies in degree, and it is attributable to different causes. Hence dysmenorrhœa is divided into three species,

so distinct in their pathology as each to necessitate distinct treatment.

1. Neuralgic.
2. Congestive, or inflammatory.
3. Obstructive.

The class of cases which range themselves under the head of obstructive dysmenorrhœa, present difficulty in the *emission* of the menses, usually consequent upon an occluded or strictured condition of the canal of the cervix uteri. This occlusion may be a congenital malformation, a sequela of inflammation, and, probably, ulceration, or in connection with chronic hypertrophy and elongation, and may be found at the os tincœ; in any portion of the cervical canal; or at the opening between the cavities of the cervix and body—the os internum. But as there is dysmenorrhœa without stricture, so also stricture may exist without dysmenorrhœa. To produce obstructive dysmenorrhœa, there must be a want of relation between the quantity of fluid secreted and the quantity emitted, or allowed to escape, so that retention ensues, of a greater or lesser amount. The suffering arises from the uterus contracting to expel that which is retained. The symptoms do not differ materially from those of the other varieties. The

discharge is, however, attended with fibrinous exudations, and small clots, more or less broken up, by being forced through the contracted os. The extension of the irritation to the ovaries, is apt to induce in them chronic inflammation. There is severe pain in one or both groins, above Poupart's ligament, and darting down the thighs. The parts affected are very tender, and seem swelled to the mind of the patient. But the precise nature of the disease must be distinguished by a physical examination of the uterus; not merely with the fingers, per vaginam, as that only enables us to feel the cervix, and the parts resting on the roof of the vagina, but recourse must be had to the "uterine sound," for which we are indebted to Professor Simpson. By this instrument we can precisely determine the nature of the disease, its character, and extent; and when it is associated with tactile, and visual examination, we are possessed of admirable means for the diagnosis of uterine affections. The instrument is less difficult to pass than a female catheter (the "touch" detecting the os uteri more easily than the meatus), and gives as little uneasiness. Therefore, in ordinary conditions of the os and cervix, it glides with the greatest facility through the cavity to the fundus. But when the canal is

obstructed, whether by congenital arrest of uterine development, or by the products of inflammatory action, it is impossible to penetrate, even with a fine bougie, or small probe. The late Dr. Mackintosh, of Edinburgh, was the first to suspect that mechanical obstruction might produce dysmenorrhœa and sterility. This was in 1823. In 1826, he essayed the dilatation of the strictured parts, by long, straight bougies of different sizes, gradually increased, introduced for a short period, and repeated from time to time, precisely in the same manner as for stricture of the urethra, in the male. This plan was eminently successful in a large number of cases, that had previously resisted treatment. Similar results obtained in the hands of Professor Simpson, but he found the bougies more easily used when curved. Subsequently, he adopted a dilator, similar to that used for the female urethra, and abandoned it in turn for a *permanent* bougie of Berlin silver. This instrument has a stem of two and a quarter inches long, which passes into the uterus. The lower end, which rests in the vagina, is of the size and shape of a large almond, perforated below for a temporary handle, with which to introduce it. It is left for three or four days; then, the parts being relaxed, is withdrawn, and

superseded by a larger one. In favour of this permanent form of bougie, it is advanced that it can be worn without inconvenience, or even without the patient knowing that it was "in situ;" it gives less pain to the patient—less trouble to the surgeon; is more certain and expeditious, and especially useful when the surrounding tissues of the lips and cervix are in any degree indurated. More recently, the inventive and progressive obstetric professor, has divided the os to the extent of a few lines, with a very narrow knife, or "lithotome caché," afterwards keeping the parts temporarily dilated by sponge tents. He described this operation at the Medico-Chirurgical Society of Edinburgh, in 1844, and it has since been adopted by Rigby, Protheroe, Smith, Oldham, Whitehead, and others. Obstructive dysmenorrhœa has thus satisfactorily been cured by various means—elastic and metallic bougies, gentian, elmbark, sponge, and metallic tents—dilators with blades of well-tempered steel, and the instrument resembling the "lithotome caché." Lastly, I have attempted another innovation or improvement, as the case may be, and that with decided success,—a trochar caché. The instrument, twelve inches long, has a canula eight inches in length, attached to a handle of three

inches, and slightly curved at its free extremity. A trochar passes through the canula, and a little beyond the handle, terminating in a button, by which it is pushed forward sufficiently through the free extremity of the canula, being concealed until it reaches the os uteri. It is then applied to the os, and the whole instrument being pressed onward, pierces the stricture, and perforates the canal of the cervix. The uterus must be kept as much as possible "in situ," by properly applied pressure above the pubis, and considerable force is necessary, owing to its mobility in the pelvis, and the condition of the tissues operated upon.

The procurement of this instrument was necessitated by recommending the operation in the case, which is the subject of this memoir, the details of which will illustrate the nature of the disease—its symptoms, exploration, diagnosis, treatment, and result

On the 17th December, 1858, I was requested by Dr. Sconce, to meet him in consultation. The patient, Mrs. A., resided at Emerald Hill, and supposed to be suffering from congestive dysmenorrhœa, had been treated accordingly, by hip-baths, sedatives, aperients, cupping, leeches over the sacrum, and to the cervix uteri, &c. For six months she

had been attended by my friend, Dr. Sconce, but a long time prior to that, had been under medical treatment. The lady was 34 years of age, had been a colonial resident for nineteen years, in New South Wales and Victoria, and had been married four years, during the first of which, she had enjoyed excellent health. But three years ago, whilst menstruating, she caught a severe cold, and the catamenia were suppressed, since which time she has been ill; has become this week hysterical; sleeps badly; and suffers greatly at the menstrual periods. She now complains of great pain in the inguinal regions, darting through the pelvis, and down the thighs, especially in the course of the sciatics. Her pulse is 94, small; tongue dry, furred; nausea, and occasional vomiting; bowels confined, their operation invariably giving pain; urine scanty, and loaded with lithates. Examination showed great fulness of the abdomen, which was exquisitely tender on pressure; "the touch" indicated the same condition of the cervix uteri, which the speculum further revealed to be hypertrophied, and intensely congested; and, lastly, it was impossible to penetrate the os, either with the sound—a fine elastic bougie—or even a thin probe. As the result of this investigation, I advised opening

up the canal of the cervix, to which Dr. Sconce at once assented, and the prospect of relief soon obtained the acquiescence of the patient. The operation was performed early in January, 1859, with the "trochar caché," and in the manner I have already described, through the speculum, the one used in this instance being Charriere's. Considerable force was necessary to effect the perforation, the whole canal being constricted. As usually happens, the hæmorrhage was profuse, but controlled by packing the upper part of the vagina with lint. A "gentian tent" was inserted, being less expansible than sponge, dilating more gradually, not decomposing, and furnishing sufficient mucilage to protect the irritated surfaces. After eight days, however, these were superseded by sponge tents, successively increasing in size. Combined with this, the powers of the system were regulated and improved by aloetic purgatives, tonics, and alteratives. Four months afterwards she was in excellent health, had a good appetite, rested well, was very cheerful, and developing embonpoint. The os and cervix were patent, readily admitting the sound, and she menstruated freely.

CHAPTER V.

NEURALGIA OF THE EPIDIDYMIS.—ITS NATURE AND TREATMENT.

Its treatment an opprobrium to the chirurgial art—Analogy of “*tic douloureux*”—Usual effect of therapcautic remedies—Sir Astley Cooper’s “*dernier r  sort*”—Globus major of epididymis the seat of pain, not the testis—Paroxysmal character of pain and its radiations—Attendant psychological phenomena—Causes numerous and obscure, to wit, an  mia, dyspepsia, ealeulus, h  morrhoids, varicoeele—Morbid condition of urethra—Of prostate—Seminal discharges, and struetural disease of kidney—Sir Benjamin Brodie—Anatomical structure—Divisions—Attachments and relation of epididymis—History of case—Anteedent operation for cure of varicoeele—Present symptoms, and psychological condition—Inutility of therapeutic remedies—Operation, passing four setons of ligature silk through globus major of epididymis—Loeal condition of affected part prior to operation—Subsequent treatment and results.

THERE is no greater opprobrium to the scientific surgeon than the treatment of neuralgia, especially of the testis, or its connections; that is, neuralgia *per se*, and of the nature of what is popularised as “*tic douloureux*,” when occurring in the facial nerves. All therapeutic remedies are successively employed, with the usual result to the sufferer, of no relief; and his existence is so darkened by the despondency that “hope deferred” engenders, as to make him willingly subscribe to any means of

relief, even to that advised and practised, of eastration. My researehes into the history of this disease, its treatment and results, display nothing more satisfactory than this “*dernier résort*.” I trust, however, the narrative of this case will enable me to add a not insignificant item to the history of conservative surgery.

It is admitted, then, that a painful or irritable condition of the testis, or the parts in relation to it, may occur without actual structural disease. It may be seated in the spermatic eord, and extend to the epididymis, or body of the testis ; but, usually, it will be found, on elose inspection, situated in the globus major, or head of the epididymis,—probably affecting the plexus of nerves, around the spermatic vessels. The pain, generally, is of a paroxysmal character, with heightened sensibility, and exquisite tenderness on pressure—extending up into the groins, and darting into the back and thighs. There is, also, slight fulness of the affected part, but the swelling is soft and flaccid. The psychological eondition usually associated with this malady is one of great disquietude, melancholy, and despondency, amounting even to a suicidal tendency ; and young men of a nervous, excitable temperament are espeecially obnoxious to it.

The causes of this disease are involved in great obscurity. Cases occasionally occur which are traceable to irritations existing in distant organs, and its cessation is coincident with the disappearance of the primary disorder. Thus, it may be connected with an anæmic condition of the blood, and gradually disappear under the influence of the ferruginous tonics. It may wait upon chronic irritation of the stomach, and chylo-poietic viscera, and be dissipated with their attendant dyspepsia. The transit of a calculus of some magnitude from the kidney along the ureter may continue it, until it drops into the bladder.* It has been excited by structural disease of the kidney,† independent of calcareous concretions. External hæmorrhoids, or varicocele, may induce it; to be remedied by the operations for the removal of such local irritations. And, lastly, it may be met with in nervous, hypochondriacal, and prostate persons, who labour under diseased conditions of the urethra, prostate, or excessive spermatic discharges.

The case we have in view, however, is that pure neuralgia, which produces paroxysms of excruciating

* Accompanied with retraction of the testicle, from spasmodic action of the cremaster muscle.

† SIR B. BRODIE.

pain, rendering the parts tender, and slightly swollen, and the seat of which is in the epididymis. The convolutions of the excretory seminal ducts form the epididymis. The aggregation of them most numerous constitutes the globus major, or head; and attached to it, is a small pedunculated body, the use of which is unknown. It is further divided into the body, and globus minor; the former being the central, and the latter the lowest portion, which curves slightly upwards, and terminates in the vas deferens. This long, narrow, flattened body lies on the outer edge of the posterior border of the testicle; its upper end, the globus major, being closely connected with that gland, by means of its efferent ducts, whilst the globus minor is attached to it by cellular tissue, and a reflection of the tunica vaginalis. The outer surface, as well as the upper and lower ends of the epididymis, are free, and covered by serous membrane,—the central portion is connected to the posterior surface of the testis, by a fold of the serous membrane, which almost completely invests it, save at its posterior border.

The subject of this memoir is identical with Mr. J. C., a storekeeper in North Melbourne, who is subsequently described in these contributions,

as undergoing an operation, for the cure of varicocele—long prior to the performance of which, he suffered from neuralgia on the opposite or right side. It was kept in abeyance, however, by the distress consequent upon the other malady, although he had endured great agony from it, during two years. The paroxysms were attended with sickness and fainting. He was melancholy, nervous, preferred solitude, and was debarred from concluding his matrimonial speculations. Such was his mental condition, that he would undergo anything to be relieved—life was a burthen. Consecutively, I employed quinine, iron, iodine, strychnine, belladonna, and the external application of atropine. The auxiliaries of cold applications, douche, &c., ad infinitum, were also resorted to, until the 15th August, when, assisted by Dr. Bowman, I passed three straight needles, armed with silk ligatures, through the globus major of the epididymis. Withdrawing the needles, the ends of the ligatures were loosely tied together to prevent their accidental removal. Before operating, examination of the testicle showed no change in the structure of that organ nor occasioned any pain, but the upper end of the epididymis was slightly swollen, and so excruciatingly tender on the slightest manipulation,

that it was impossible to approach the patient until under the full influence of chloroform. Considerable swelling ensued after the operation; the ligatures were drawn through daily, during the first four days, and withdrawn entirely on the sixth. The swelling gradually subsided; the pain entirely disappeared; he is well, happy, and about to complete his marital contract, with restored health and vigour for its consummation.

CHAPTER VI.

VARICOCELE.

Recognised by other appellatives—Circumstances favourable to its occurrence in Australian Colonies—Early history of the case—Patient's application to Guy's Hospital, and treatment adopted—His arrival in Victoria—Gradual aggravation of the disease—Advice of Mr. Hunter obtained, and operation proposed, but not carried into execution—General and local symptoms—Diagnostic signs—Recourse to Velpeau's method—Its objects and effects—Subsequent treatment, and complete cure—State of the parts previously affected, and psychological condition at this date—Nature of varicocele—Relations of spermatic veins—Circumstances which render them peculiarly obnoxious to varix, especially on left side—Authorities—Double varicocele—Predisposing causes of varicocele—Variations in size—Easy diagnosis—Cases for palliative treatment—Its object, and means of accomplishment—Radical extermination—Table of modes of effecting it, by ancient and modern surgeons—Velpeau's and Vidal's methods most worthy of attention—Fate of the distinguished surgeon, Delpech.

VARICOCELE is recognised by other appellatives, to wit, cirsocele, spermatocele. From the warmth of the climate, and the habits of equitation so universally practised in these colonies, the disease will, probably, frequently present itself to the notice of the Australian surgeon. I may premise, then, that the subject of this memoir will not be wanting in interest or utility.

Mr. C., a storekeeper, residing at North Melbourne, applied to me in October, 1858, on account of the suffering occasioned by a large varicocele. When 19 years of age, he first experienced uneasiness, and, being resident in London, became an out-patient at Guy's Hospital. Cold and astringent applications were adopted, and the use of a suspensory bandage. Subsequently he came to this colony, where he has now lived some few years. The disease remaining, with a continuous increase in size and suffering, he consulted Mr. Hunter, who suggested an operation for his relief. The fee, however, was such as his circumstances could not readily accomplish ; but, still anxious for relief, he consulted me. At this time, he was 28 years of age, suffering from intense pain, generative debility, and hypochondriasis. On examining the scrotum, it presented a large pyramidal tumour, as large as a swan's-egg pear, its base resting on the testis ; the apex stretching up to the abdominal ring. This tumour communicated a knobbed or knotty feeling, from the irregularly distended and convoluted veins. It disappeared to a certain extent when recumbent, but returned to its original size on assuming the erect position—notwithstanding the application of pressure to the external abdomi-

nal ring. It was increased by taking a deep inspiration, by coughing, or straining. There was no alternative but an operation, and I determined on resorting to what is known usually as "Velveau's method," and performed it on the 19th October, assisted by Dr. Martin. The object in view was to excite plastic inflammation of the veins, by compression, and so obliterate them. He was directed to lie down, for the purpose of emptying the distended vessels, as much as possible, by gravitation. The "vas deferens" was then carefully drawn to one side, firmly held, and three pins passed between it and the veins (including as small a portion of the skin as I possibly could); the twisted suture applied, and the ends of the pins cut off. Great redness and swelling ensued, until the sixth day, when the pins were withdrawn, and the irritation gradually subsided under the continuous use of cold and wet applications. He wore a suspensory bandage for three weeks, and was then dismissed, cured. At this period, the scrotum and testis are perfectly normal; no trace remains of their previous condition, or the means by which it was relieved. His mind has recovered a cheerful, equable tone; and he has a perfect adaptability to marital duties, upon which he is speculating.

Varicocele—or by whatever cognomen the disease is recognised—signifies an enlarged or varicose state of the spermatic veins. These extend from opposite the upper lumbar vertebra, to the plexus pampiniforme, which forms the base of the pyramidal swelling, that constitutes the fully-developed tumour. The distance these veins traverse, gives a corresponding length to the column of blood contained in them; the weight of which, and the absence of valves to support it, necessarily subjects them to outward pressure. An obstruction existing to the return of blood, eventually they yield, and become dilated and tortuous. To such obstruction the left spermatic veins are peculiarly liable. Two causes tend to induce it:—

1. Pressure from fœcal accumulations in the sigmoid flexure of the colon.

2. Returning their contents into the left renal vein, at right angles to the current of blood, flowing through it into the vena cava.

To regard these as predisposing causes, we have the authority of Morgagni, Mayo, Petit, Callisen, Richerand, Blandin.

The long course of the left spermatic veins—(their length increased by the lower position of the corresponding testis)—the absence of valves in

them, their feeble coats, the *ascending* column of blood, and the pressure of the distended colon, render them peculiarly obnoxious to varix, whilst the right are rarely affected, and never without the left participating,—so as to constitute, according to Blandin, a double varicocele.

Varicocele may be induced by many causes—corpulency, constipation, warm climate, equitation, excessive venery, masturbation, &c.; any circumstances that produce weakness of structure, and obstruction to the return of blood. Petit states that it may vary in size, from slight fulness, to that of a child's head, measuring several inches, in fact, in circumference, at the base. The diagnosis is easy, from its peculiar feeling, and pyramidal shape,—lessening when recumbent, but returning on re-assuming the erect position.

The severity of the symptoms is in proportion to the extent of the disease. In mild cases, palliative treatment must be adopted, its object being—

1. To diminish the length of the column of blood.
2. Give tone to the parts.
3. Prevent any obstruction to the return of blood, from the accumulation of fœcal matter, in the sigmoid flexure of the colon.

The first of these indications is to be secured by

supporting the testis with a suspensory bandage; the second, by cold astringent lotions, and the “douche;” and the third, by keeping the bowels thoroughly open.

But when serious inconvenience occurs, intense suffering, generative debility, or threatening atrophy of the testis, with concomitant mental despondency, we must have recourse to such means as promise a radical extermination of the disease, by exciting plastic inflammation in the veins, and so obliterating them. Such attempts have the authority of very ancient writers—Paulus Œgineta and Celsus—as well as the sanction of more modern surgeons, and may be tabulated—

1. Blisters and counter-irritants to inflame and condense the scrotum.—(SIR BENJAMIN BRODIE.)

2. Pinching up the loose skin of the scrotum, and confining it with a ring.—(WORMALD.)

3. Division of the veins, by the knife or scissors.—(BRODIE.)

4. Potential cautery.—(MAYO.)

5. Seton—passing threads through the veins.—(FRICKE.)

6. The application of Evans’s patent lever truss, to the external abdominal ring.—(ERICHSEN.)

7. Tying up the skin of half the scrotum by

ligature, with all the vessels, except the artery, and vas deferens, so as to divide them by ulceration.

8. Cutting away a considerable piece of the relaxed skin.—(SIR ASTLEY COOPER.)

9. Pins and twisted suture.—(VELPEAU, DAVOT.)

10. Passing ligatures subcutaneously, to divide the veins only.

11. Castration.—(GOOCH.)

12. Cutting down upon the veins, and putting a ligature round them.—(CELSUS, SIR EVERARD HOME, PAUL CUMANO.)

13. Cutting away the varicose clusters.—(PETIT, DELPECH.)

14. Pinching up the veins with the skin, by means of a pair of compressing forceps.—(BRESCHET.)

15. Passing a seton of three or four threads through the varicose bundle.—(FRICKE.)

16. Exposing the veins, and applying caustic potash.—(MAYO.)

17. Passing a pin of steel or silver, having a moveable head, *behind* the veins, between them and the vas deferens. A fine silver wire is then carried, by means of a needle having a slit to receive it, through the same aperture, *in front* of the veins—the plexus of vessels being thus *between* the pin and the wire. The points of the pin are then removed,

and the ends of the wire twisted round the corresponding ends of the pin. By these means, the veins are not *simply* compressed, but *the compression is gradually increased*, and they are rolled up and shortened by daily rolling up the pin, so to twist another turn or two of the wire round it. This is repeated for eight or ten days, and obliteration is thus effected by plastic deposits.—(VIDAL.)

Much stress has been laid upon the risk attendant upon these operations; but where the severity of the symptoms warrants the removal of the disease, we may employ, without dread, Velpeau's method, to which I had recourse in the case herein narrated,—or Vidal's, which I have tabulated last, and described "in extenso." The bugbear of inflammation should not fright us from our propriety, nor need we anticipate the unhappy fate of Delpech—being assassinated by the patient, if suppuration of the testis ensues.

CHAPTER VII.

ABSCESS OF BONE.

Circumstances which render it difficult to obtain a knowledge of the pathological changes in the early stage of bone disease—John Hunter's demonstration of analogy between the hard and soft structures of the body—First appreciable changes of inflammation of bone, in Haversian canals, according to Goodsir—Inflammation of bone usually chronic, except from mechanical injury—Pathological sequence of progressive inflammation—Congestion, exudation, supuration, caries, necrosis—Coincident increase of bone in adjoining parts—Case—Its history, past and present—Pain, at first remittent, subsequently continuous—Charlatanry and orthodoxy, their routine similar, results equal—Condition of affected parts on examination—Character of swelling—State of skin—Nature of pain—Appearance, complexion, and complaints—Treatment—Exhibition of proto-iodide of mercury—Application of atropine—Anticipated result—Trephining the tibia proposed—Performed—Anæsthesia—Operation—Crucial incision—Application of trephine—Removal of "button of bone"—Elevator—Pus in the cavity—Disintegration of cancellated structure—Usual rapid oozing of blood—Dressing—Discharge, at first, fœtid, purulent, afterwards laudable—Subsequent treatment and progress—Cure—Experience of Sir Benjamin Brodie—Observations of Mr. Henry Lee—Quantity of contained pus, usually small, easily overlooked—Benefit always derived from operation—Cavity gradually fills up—Limb regains its primitive utility—Affections likely to be confounded with "abscess of bone"—Diagnostic indications—Care to provide two trephines, with crowns, small, deep, and of equal size.

It is a matter of the utmost difficulty to obtain a knowledge of the early stages of bone disease, and its accompanying pathological changes. This difficulty arises from the physical peculiarity that the

normal structure of bone presents. The rigidity of bone, and the large amount of earthy matter which enters into its composition, disables us from making such frequent and close examination of it as the soft tissues permit. Indeed, in many cases, it is absolutely impossible, with our present means of diagnosis, to determine whether the disease has commenced in the periosteal covering, or its subjacent bone; periosteal morbid action being occasionally followed by products precisely similar to those which arise from disease primarily seated in bone itself. There is, however, a close analogy between the hard and soft structures of the body, which John Hunter was the first to demonstrate. Osseous structures are subject to an increase in their vascular contents, equally with other organic tissues; this vascularity affecting chiefly the lining membrane of the medullary and cancellous portions. John Goodsir, Professor of Anatomy in the University of Edinburgh, asserts that the first appreciable inflammatory changes occur in the Haversian canals; the result of which is their enlargement, by conversion of contiguous canals into one cavity, consequent on the removal or absorption of all the osseous textures pertaining to them.

Inflammation of bone is rarely of an acute

character, except from mechanical injury; it usually assumes the chronic form, inasmuch as its dense structure permits only a necessarily slower process of change than the soft tissues.

The pathological sequence of progressive inflammation of bone is,—

1. Congestion.
2. Exudation.
3. Suppuration.
4. Caries.
5. Necrosis.
6. Coincident increase of bone in the adjoining parts, occurring from changes that take place in the interior of the bone from a deposit on its surface, or both.

When inflammation of bone occurs, and no resolution is effected of the congestive stage, exudation occurs of “a rose-coloured jelly-like lymph,” which, if not absorbed, either becomes organised and converted into new bone, or a destructive process ensues. The morbid action continuing, suppuration is established, which may be circumscribed or diffuse—the latter being the most dangerous. If circumscribed, the cavity is formed in the substance of the bone, lined with a vascular membrane, and filled with pus. The bone usually affected is

the tibia, which is most exposed to direct mechanical injury. A single instance will serve to illustrate the symptoms, diagnosis, treatment, and results.

On the 11th December, 1858, I was consulted by Mrs. J., a blonde, 26 years of age, an English lady, who had been resident for some years in this, and previously, in the neighbouring colony of South Australia. Her antecedent history was to the effect that she had enjoyed good health until the infliction of a severe blow on the shin bone, which had entailed great suffering up to the present time.

Four years and a half had elapsed since the receipt of the injury. At first, the attacks were remittent, but during the last three years, she had *never been free from pain*. Originally, she had been attended by a Mr. Parsons, who was subsequently exposed as an unqualified practitioner, but afterwards had the supervision of orthodox physic in the professional care of Drs. — and —. Charlatanism and orthodoxy had subjected her to a treatment which consisted of bleeding, leeching, blistering, iodine, opo pencilli, stimulant, rubefacient, epispastic, and suppurative applications, ad infinitum. These had all equal results—no amelioration or benefit whatever. The examination which followed

this forlorn recital, showed a convex, indurated swelling on the inner side of the tibia four inches in length. The skin covering it was red, but inquiry elicited that it was so only occasionally, usually presenting a normal appearance. *She was never free from pain*, and this pain was of a constant, throbbing, tensive character. In appearance, she was much emaciated; her complexion sallow; tongue furred; and pulse feeble. Her personal narrative comprehended a complaint of great debility, loss of appetite, and never-ceasing pain, with a wish that death would relieve her from such persistent misery. With certain directions as to diet and regimen, I contented myself, until further confidence was secured, by prescribing—

Hydrarg. Protoiodidi gr. ii.
Ext. Aloes. (aquos) gr. xii.
— Hyoscyami gr. viii. M.
Fiant. Pil. viii., Capiat ii., omne nocte.

and advising friction, night and morning, with a liniment composed of—

Atropine (Morson's) gr. vi.
Linim. Camphor Co. ℥ii.
— Saponis ℥i. M.

This treatment was continued for some time, but with anticipatory effects of a merely palliative character, of which I had forewarned her. Such

being the result, and convinced there was an abscess in the bone, I recommended trephining the tibia, to which she consented, especially as Dr. — had previously informed her, “the bone ought to be scraped.” On the 31st January, 1859, I performed the operation, assisted by Drs. Bowman and Martin. To the former of these gentlemen was entrusted—from his experience—the placing of the patient in a state of anæsthesia, a matter of the utmost importance to the comfort and safety of the patient, as well as an invaluable auxiliary to the surgeon. I commenced the operation by a crucial incision down to the bone, exposing it freely, and allowing free scope for the application of the trephine, with which, having sufficiently penetrated the tibia, I removed “the button” of bone by the elevator, and gave exit to the pus, pent up in the cancellated structure, which was spongy and very brittle from disintegration. The rapid oozing of blood, usually attendant in operations on bone, was exceedingly troublesome, and tended much to obscure my progress. The cavity in the bone was now dressed with lint from the bottom, and a poultice applied. A free discharge of unhealthy-looking and foetid purulent matter resulted, and continued for several days,

but at last assumed the character of laudable pus. Pain was complained of until the seventh day after the operation, when it ceased entirely, and has not since returned. The wound was syringed daily with a solution of sulphate of zinc, and dressed from the bottom with lint saturated in the same. Alterative and tonic medicines were prescribed—port wine and generous diet enjoined, and after one month, nothing remained but the stain (not scar) of the cicatrix, to remind her of her previous sufferings, or the operation she had undergone. Her general health has improved, and emaciation has been succeeded by so much embonpoint, as to make a very agreeable “tout ensemble.”

The experience of Sir Benjamin Brodie, and the observations of Mr. Henry Lee, corroborate my experience, that when chronic morbid action leads to circumscribed suppuration of bone, the abscess is usually of very small size, and deeply seated in the substance of its head, or medullary canal. The superincumbent osseous tissue having long been the seat of chronic inflammation, becomes greatly thickened and indurated. The quantity of pus contained in the abscess is very small—as may be readily understood—a few drops. When the diseased cavity has been opened it may easily be

overlooked, as it is carried away in streaks with the blood which flows freely from the cut bone. Sometimes no pus escapes, but there may be lying in the cavity a piece of necrosed bone, or some dark gritty masses of disorganised osseous tissue may be exposed, which require removal; the latter with the gouge. Even if none of these conditions be revealed, the patient will still be materially benefited by the relief to the compression of the osseous tissue, afforded by removing the circle of bone. The cavity gradually fills up with fibrous tissue; the limb acquires strength, and is ultimately restored to its primitive utility.

The affections most likely to be confounded with "abscess of bone" are neuralgia, and chronic inflammation. But careful attention to the symptoms, will render the diagnosis certain. Usually, after the receipt of an injury, one spot of the affected bone becomes swollen and painful. In most cases, the skin covering it is of its natural colour; in a few, it becomes red, glazed, and œdematous. The pain is of a lancinating, aching character, usually remittent, often ceasing for days, weeks or months; but re-excited by the most trifling circumstances, with its former severity, and especially troublesome at night. The pain is

always associated with tenderness of the part. This tenderness may be detected by careful examination, even during the remissions, in some spot of the enlarged and indurated bone. The diagnosis then, is—

- a.* Permanent inflammatory enlargement and tenderness, which may have lasted for years.
- b.* A fixed tensive pain at one particular spot—with nocturnal exacerbations—unrelieved by any remedy, though, in some cases, occasionally remittent.

The persistence of these signs indicate abscess, which can only be relieved by exposing the bone, by means of a T. V. or crucial incision, over the affected spot, and applying the trephine. Some care is necessary with regard to this instrument. The crown should be small and deep, and two should be provided of exactly the same size and calibre, as one is very apt to become disabled by the density and hardness of the osseous tissue it has to perforate, and it is essential that the auxiliary should fit the same groove. With a semi-rotatory motion the bone must be perforated to a sufficient depth, taking the precaution not to pass through its whole thickness. The “button” must then be raised by the elevator. The diseased cavity being opened, a small quantity of pus may escape, or

there may be lying at the bottom a piece of necrosed bone, or disorganised osseous tissue. If none of these conditions exist, the neighbouring osseous tissue must be pierced, with a perforator, in different directions, in the hope of reaching the abscess, and giving exit to its contents. The wound should be dressed from the bottom with lint, and a poultice applied. The cavity of the bone gradually fills up and becomes obliterated.

Thus we have available an operation entailing no danger, and giving complete and permanent relief to a malady of the most painful and wearing character.

CHAPTER VIII.

TRAUMATIC STRICTURE OF THE URETHRA.

Mucous canals obnoxious to contraction, urethra especially so—Amount of contraction varies—Object of the present disquisition—Early history of the case—Urethral laceration—Treated in Dr. Brownless's hospital—Aggravation of symptoms, and treatment by Messrs. Macarthy and Brownless—No hope of relief—Leaves for England—Treated by Mr. Teale, of Leeds, with partial success—Attack of complete retention of urine, during return-voyage to Melbourne—Inability of ship surgeon to introduce catheter—Relief from hot baths and opiates—Miserable condition on consultation—Incontinence of urine—Forewarning from previous military experience—Liability of cavalry soldiers to urethral laceration, followed by strictures of the most obstinate character—Extreme liability to retention of urine—Chemical and microscopical examination of urine—Constitutional treatment—Ineffectual efforts to introduce No. 1, facilitated by chloroform—Urethral pain, and belladonna injection—Formula—Consecutive introductions of larger sizes—Muco-purulent discharge—Therapeutics—Enabled to retain urine on the 8th day—No. 9 passed—Matrimony—Average total length of urethra—Measurements—On dead subject, Thomson—On living, Briggs—Anatomical divisions, and respective measurements—Approximate measurement of width, from passage of calculi—Demonstration of muscular fibres—Kolliker, Hancock—Meatus—Spongy portion—"Fossa navicularis"—"Sinus of the bulb"—Membranous portion, its direction, prostatic—Thompson's subdivision into three regions—Extent occupied by localization, and per-centage of strictures in each—Thompson's analysis—Assertions of Hunter, Home, Brodie, Philips, Civiale, Amussat, Vidal, Ducamp, D'Etiolles, Ricord—Causes of greatest frequency in first region—Researches of Thompson and Rokitansky—Non-liability of prostatic portion to stricture—Definitions of stricture—Thompson, Syme, Sir C. Bell—Classification of strictures—Hunter, Cooper, Syme—Thompson's division into permanent and transitory—Origin and cause of permanent strictures—Division of transitory strictures—Effect of acute inflammation—Rokitansky and Hancock—Variety in amount of constriction—Obliteration, a sequence of traumatic injury—Causes of permanent stricture—Opinion of John Hunter—Antagonised by

Abernethy, Lawrence, Liston, Chelius, Ducamp, Civiale, Home, Cooper, Bell, and Brodie—Alleged causes of permanent stricture—Their futility—Granulations in urethra impeding flow of urine—Belief of ancient anatomists and surgeons—Polypoid growths—Effects of mechanical pressure of urine, from obstruction, to the bladder, ureters, kidneys—Effects on urethra, chemical and mechanical—Inflammation, ulceration, infiltration, fistula—Number of strictures in same urethra—Degree of permeability—Symptoms of permanent stricture—Constitutional irritation not in accordance with amount of contraction—Necessity for correct diagnosis—Proper size of instrument for exploration of urethra—Reasons for its adoption—Mode of procedure—Utility of glycerine—"Tour de main"—Amount of force, and period of its employment—Graduated increase in size of instruments employed—Objects of treatment—Therapeutic indications—Value of belladonna—Of chloroform—Position of patient, recumbent under chloroform; erect otherwise—Mode of supporting patient, when erect—Various instruments employed—Personal preference of a solid sound, with especial curvature, and conoid shape—"Impermeable" stricture—Disquisitions thereon, and misunderstanding—Liston's dexterity, and consequent belief—Averred failure, during his late years, by Mr. Cadge—Syme's disbelief of impermeability—Difference in graduation of his bougies and catheters to those in general use—Syme's tapering bougie—Dupuytren's method of promoting absorption of stricture, "vital dilatation"—Approval of Velpeau and Guthrie—Arnott's hydrostatic hobby—Dilators, Perreves, Holt, Wakley—Wakley's tubular treatment—Also applicable to strictures of rectum, œsophagus, and cervix uteri—Commended by Guthrie, Keate, Fergusson, Crampton, Liddell, Solly, Coulson, Lizars—Equally adapted to simple forms of urethral contraction, and most intractable cases—Composition of set of instruments—Three guides, eleven silver tubes, and eleven flexible catheters, lined with flexible metal—Minute description of the whole, their graduation, exact adjustment, mode of introduction, and effect—Plan of treatment—Advantages—Escaroties—Argenti nitras—Potassa fusa—Their former and present advocates—Trite observation of Sir B. Brodie—Mr. Adams' creed—Syme's belief—Incisions—M. Civiale's estimate of dangers from internal urethrotomy—Their enumeration—External incision—Where practised—Grooved director—Syme's operation—His personal experience of fallacy of statistics with regard to it—Improvements on Syme's staff, by R. Maekenzie, Haynes Walton, and himself—Maunder's "Urethrotome"—Modes of treating permanent stricture—Those that have fallen into desuetude.

ALL mucous canals are obnoxious to a contraction of their calibre, at some parts of their course. I have already descanted on those that occur in the intestinal. Contractions of the urethra present

themselves, however, with greatest frequency ; and no subject connected with the surgical art, more engrosses the attention of eminent surgeons at the present time. The amount of constriction varies from a slight narrowing to almost complete obstruction of the channel ; for the treatment of which, a full and comprehensive knowledge is essential, as regards the causes, site, and nature of the obstruction. There is no class of cases, however, which depends more on the individual dexterity of the surgeon, and that “unwritten experience” which practice engenders. An instrument that would be dangerous in the hands of a young practitioner, possesses a magical power when wielded by a surgeon, whom frequent exploration has rendered familiar with the delicate structures, and endowed with exquisite tactile sensibility. The object of the present disquisition is to illustrate that patience, perseverance, and manual dexterity, aided by appropriate therapeutic measures, are sufficient for the successful treatment of most cases of strictured urethra, without resorting to operations which cannot be divested of danger.

G. M., the subject of this case, was a man 30 years of age, and of phlegmatic temperament. His occupation was that of a farrier, his habits those of

a "bon vivant." Four years before, he was riding a restive horse, which, plunging and curvetting, threw him on the pommel of the saddle, and ruptured his urethra. For the efficient treatment of this accident, he became an inmate of Dr. Brownless's hospital. Soon after, he experienced difficulty in micturition, and pain in the perineum; these symptoms being accompanied by a gleet discharge from the urethra. The difficulty in voiding urine, and pain and discharge increasing, he was, for some time, treated by Messrs. Macarthy and Brownless. But no benefit resulting, nor any prospect of it, he sailed for England, in quest of that relief which he despaired of obtaining here. On arrival, he placed himself under the care of an eminent surgeon, Mr. Teale, of Leeds, Surgeon to the Leeds General Infirmary, and late Lecturer on Anatomy and Physiology in the Leeds School of Medicine. This gentleman treated him for several months, and succeeded in passing cat-gut bougies, and elastic catheters, until No. 4 was attained, but not beyond. Satisfied with this, he returned to Melbourne, but, during the voyage, had an attack of complete retention of urine, to relieve which, the medical officer pertaining to the ship attempted the introduction of a catheter. This, however, he

was unable to accomplish; but the desired effect was procured by means of a hot hip-bath, and an opiate. No further treatment was employed until he reached Melbourne, when he consulted me on the 8th August, 1858, complaining of great pain in the perineum and about the anus, as well as urethral discharge and incontinence of urine—the latter excretion continuously escaping, *guttatim*. This dribbling, and the offensive odour thereby created, of which he was painfully aware, debarred him from all society, and rendered him intensely wretched. An exploration of the urethra demonstrated a permanent stricture at the sub-pubic curvature (that is, at the junction between the spongy and membranous portions), through which I was wholly unable to penetrate. My military experience forewarned me, from the antecedent history of the case, that I had to treat a most unyielding, tight, and obstinate stricture. Cavalry soldiers are peculiarly subject to stricture from urethral lacerations, involved during hard riding and leaping, by being thrown against the pommel of the saddle, or against the withers, when practising riding, bare-backed. These strictures, the result of previous urethral laceration, are invariably of the most troublesome and obstinate character.

The symptoms usually appear in the course of a few weeks after the accident, and progress from bad to worse. The patient is never safe from retention of urine, and its consequences, which the slightest causes may precipitate—an error of diet, or exposure to cold. Fully aware, then, of the difficulty of this case, and the requisite patience and perseverance for its successful treatment, I proceeded first to a careful examination of the urine, by chemical analysis and microscopic observation. Finding it unduly acid, and loaded with urate of ammonia, I prescribed, as indicated, an alkali, in combination with henbane, squills, and buchu. Having eight or nine times carefully endeavoured to pass No. 1 catheter, but ineffectually, on the 12th August the patient was placed under chloroform, and this instrument fairly introduced. No. 1 was passed again on the 14th, without anæsthesia; and on the following day the urine flowed, but in a very fine stream. The urethra, however, was excessively painful, and I ordered him to inject a solution of the extract of belladonna, warm, three times daily; the formula for which was,—

Ext. Belladonnæ ʒi.

Glycerinæ ʒiv.

Aquæ Rosæ ʒviii.

M. ft. inject.

On the 16th, No. 1 was again passed, and on this occasion, easily, and with very slight pain.

The 18th witnessed the introduction of No. 2, and its retention for seven minutes. The pain excited was very great, but instantly relieved by the belladonna injection. No. 2 was reintroduced on the 20th, and with little pain. The urine still dribbling, with a copious muco-purulent discharge, he was recommended

R Ol. Copaibæ ℥ii.
 Vin. Colchici ℥ii.
 Sp. Æther Nit. ℥iv.
 — Juniper Co. ℥iv.
 Sol. Morph. Hydrochlor ℥ii.
 Liq. Potassæ ℥iii.
 Syr. Scillæ ℥ii.
 Dec. Uvæ Ursi ad ℥viii.

Ft. Mist.: Coch. Mag. i. terguotidie ex aquæ capiend.

The belladonna injection was also continued.

By the 22nd, the stream was larger, the discharge lessened, and he was able to retain his urine, a circumstance most gratifying to him, as it enabled him to go about, without the painful consciousness of exhaling a strong urinary odour. No. 3 was now successfully introduced,—the same being repeated, on alternate days, until the 1st of September, when it was succeeded by No. 4, which, at intervals of three days, gave place, in its turn, to No. 5, on the

15th. The introduction of No. 5, with intervals of four days, was continued until 28th, when No. 6 was adopted. No. 7 followed on the 20th October; No. 8 on the 4th; No. 9 on the 28th November—and this last was repeated until the 18th December, when it was my intention to pass No. 10, but the patient had completed a matrimonial arrangement, and so discontinued his attendance. Since that time, I have twice passed No. 9, and, at the present date, he remains perfectly well.

I have previously alluded to the circumstances, a knowledge of which is absolutely essential to the correct diagnosis and treatment of strictures of the urethra. The average total length of this canal on the dead subject is eight and a-half inches,* but during life, from the observations of Mr. Briggs, formerly of the Lock Hospital, London, it may be computed at from seven and a-half to seven and three-quarter inches. It is this latter measurement we must bear in mind, with reference to treatment. This extent is divided, proceeding from before backwards, into,—

1. The meatus, or orifice.
2. The spongy portion, six inches in length.
3. The membranous, three-quarters of an inch.

* THOMPSON.

4. The prostatic, one and a-quarter inches.

The vascular condition of the urethra occasions great variations in its length, even in the same individual. Erection increases, flaccidity diminishes it. With regard to its width, approximative measurements only have been made by anatomists, and these have been stated at three, four, or five lines—from the diameters of calculi that have passed. In the normal condition of the urethra, however, when quiescent, the walls of the canal are in close apposition. Kollither has demonstrated that the urethra is surrounded in its entire length by muscular fibres, a double layer investing it at the membranous portion, and again at the meatus, or external orifice; whilst Mr. Hancock has shown that the prostatic and spongy portions are included between planes of muscular fibres.

The meatus, or external orifice, is the smallest and narrowest portion of the entire canal of the urethra. The second division, or spongy portion, is moveable, and its anterior half can assume any direction; but, as it approaches the pubis, the relations of the surrounding parts render it more fixed, and at the same time, it curves under the arch. At the distance of about one inch from the meatus, is the “fossa navicularis morgani;” this

is an enlargement, or dilatation, and is seated in the "glans." At the posterior extremity of the spongy portion, another enlargement also occurs, known as the "sinus of the bulb," or "bulbous portion." The membranous portion of the urethra is its most contracted part, with the exception of the meatus. In the erect position of the body, the direction it takes is upwards, with a slight curve—a continuation of the curve by which the posterior part of the spongy portions passed under the arch of the pubis, and which further increases in the prostatic, until, at last, the course of the urethra is almost vertical.

These anatomical divisions of the urethral canal Mr. Henry Thompson* has subdivided into three regions—an arrangement of great practical utility.

The first occupies a space of one and three-quarter inches, beginning one inch anterior to the junction of the spongy and membranous portions, and continuing backwards though the whole of the latter.

The second region is from two and a-half to three inches in length, and extends from the first to within two and a-half inches of the meatus, thus occupying the centre of the spongy portion. The

* Prize Essay on Stricture of the Urethra, by Henry Thompson.

third is included between this and the meatus. In these three regions strictures are localized, the result of analyses being, that 67 per cent. occur in the first, 16 in the second, and 17 in the third.

The general observation of eminent surgeons, corroborates this statistical analysis of Mr. Thompson, founded on 320 strictures of the urethra. John Hunter asserted its greatest frequency "about the bulbous portion;" Sir Everard Home, "just behind the bulb;" Sir B. Brodie, "anterior portion of membranous part, behind the bulb, and in the situation of the triangular ligament of the perineum;" Philips, Civiale, Amussat, Vidal, Ducamp, Leroy D'Etiolles, Ricord, and others, "at the junction of the bulb with the membranous portion."

The most frequent occurrence of stricture in this region (the first in accordance with Thompson's subdivision), is attributed to the following circumstances:

First, that here the anterior layer of the deep perineal fascia comes into close relation with the urethra, and this connection is supposed to have a certain influence favourable to contraction.

Secondly, that this is the site of those spasmodic contractions of the voluntary muscles, which oppose the passage of instruments.

And, thirdly, the researches of Thompson and

Rokitansky have demonstrated that this is one of the two spots affected by gonorrhœal inflammation, the other being the "fossa navicularis."

With regard to the localities occupied by stricture, its non-existence in the prostatic part appears almost universally agreed—the exceptions being Messrs. Ricord and D'Etiolles.

Stricture has been variously defined by different authors. Thompson illustrates it as "an abnormal contraction of some portion of the urethral canal;" Syme, "a narrowing of the canal at one or more points;" the late Sir Charles Bell, as having "lost the power of dilating," on the assumption that, in its quiescent state, the urethra is a closed canal.

So, also, authors have represented strictures as of different kinds.* Mr. Syme divides them into five classes:—imaginary, slight, confirmed, irritable, and contractile. A frequent arrangement of them exists into spasmodic, congestive or inflammatory, and organic. The most effective, however, and certainly the most facile, is into

1. Permanent.
2. Transitory.

* John Hunter gives three varieties, "permanent, true spasmodic, and mixed." Sir A. Cooper, "permanent, spasmodic, and inflammatory."

Permanent strictures are due to organic deposits, hence such are frequently spoken of as organic. Transitory strictures may have their origin in inflammation or congestion, or they may be the result of unusual muscular contractions. Those arising from the first of these causes are characterised as inflammatory strictures, the latter class are termed spasmodic.

Of the above division into permanent and transitory, the first is alone pertinent to the object of our present inquiry. Acute inflammation is rarely a cause of permanent stricture; it is most usually due to a persistence of the chronic form, and the exudation of fibro-plastic materials into the substance of the mucous membrane, and the submucous tissues. If the result of acute inflammation, the researches of Rokitansky and Hancock have demonstrated the exudation of a false membrane. The amount of constriction varies from a slight narrowing to almost complete obstruction. If obliteration occurs, it is the sequence of traumatic injury. A portion of the circumference of the urethra only may be involved, or it may occupy the whole, annular, or be stretched across, like a frænum,—the “bridle stricture” of Sir C. Bell. So also it varies in extent, pervading more or less of the canal, through its length.

The causes which induce that morbid condition of the urethra, which results in permanent stricture, are—

1. Gonorrhœa.
2. Employment of instruments in the treatment of diseases of the urethra ; and
3. Traumatic injury.

John Hunter maintained that permanent stricture could not be attributed to gonorrhœa ; but against his dictum, we have the authority of Abernethy, Lawrence, Liston, Chelius, Ducamp, Civiale, and the four baronets—Home, Cooper, Bell, and Brodie.

Among the causes capable of producing stricture, have been enumerated masturbation, horse-exercise, and habitual over-indulgence in stimulants, especially malt liquors. Masturbation, however, rests solely on the authority of Lallemand, being denied by Ricord. Horse-exercise may result in traumatic injury ; but, otherwise, this, with habitual drinking, can only be circumstances favouring the continuance of inflammatory action, and the increase of the muco-purulent discharge accompanying it.

I may here refer, *en passant*, to a form of mechanical obstruction, analagous to exuberant granulations, and variously called by olden anatomists and surgeons, “funge,” “carnosities,” “carnuncules,”

“excrescences.” These ancients supposed all interruptions to the flow of urine, to be occasioned by growths of this character; but modern surgery observes them very rarely, and when they occur, it is immediately within the urethral orifice. Polypoid growths have also been spoken of, but as limited to the prostatic portion.

I have already alluded to the degree of contraction, varying in permanent stricture. Obstruction existing to the excretion of the urine; results obtain from the mechanical pressure of that fluid.

Amongst the first of these is hypertrophy of the substance of the bladder, from increased muscular contractions, to overcome the resistance. Next follows dilatation of the ureters, from the urine accumulating in them—the natural reservoir being surcharged, subsequently the pelves and calices of the kidneys become enormously distended, pressing on the secreting substance, and occasioning its atrophy. But the mischief is not alone retrogressive. The frequent straining dilates the urethra, behind the stricture. Repeated acts of micturition, and constant irritation of urine, excite chronic inflammation, and chronic inflammation of a mucous membrane, its peculiar result—ulceration. This ulceration may extend superficially or deeply; infil-

tration of the sub-mucous tissues follows, and extends until an external opening takes place, and fistula is established.

We have seen flat strictures vary in locality, character, and extent; so also is there a diversity in the number to be met with, in the same urethra. Instances are recorded where there were

Two, (SYME,)

Three, (BOYER, THOMPSON,)

Four, (THOMSON, ROKITANSKY, DUCAMP,)

Five, (DUCAMP,)

Six, (JOHN HUNTER,)

Seven, (LALLEMAND,)

Eight, (COLOT,) and even

Eleven, (LEROY D'ETIOLLES.)

Strictures vary also in degree; but it is rare to find one altogether "impermeable" during life; and Mr. Syme alleges never, but from obliteration, of traumatic origin. Retention and fatal consequences may ensue, not from complete occlusion of the walls, but accidental blocking of the narrowed orifice by thick mucus, a flake of fibrin, or small calculi.

The symptoms of permanent stricture are very obvious, becoming more marked as the disease advances. Once formed, it will continue, and can

only be removed by surgical treatment. The amount of constitutional irritation is by no means in accordance with the amount of constriction. It frequently is very great, when the stricture is not at all tight.

A correct and conclusive diagnosis is essential, as regards the existence of stricture, its seat, extent, and amount of tightness. This can only be obtained by examining the urethra with an instrument, a plated steel sound, or silver catheter; and surgeons are agreed that one of moderate size should be employed first, for the purpose of exploration. The size No. 8, then, is usually adopted, as an instrument of less calibre might pass through the stricture, or hitch in the fossæ, or verumontanum. Finding this too large it is withdrawn, and a smaller one substituted, to be followed, in its turn, by diminished sizes, until the proper calibre is attained. These instruments should be warmed and oiled, or what is better, lubricated with glycerine, prior to their introduction. It is unnecessary to dilate upon the manner of introduction, further than to deprecate any attempts at a dashing style of catheterism, or the "tour de maitre." The urethral canal is lined by a very delicate structure, and experience only can impart that tact which

regulates the amount of force, sometimes requisite to overcome resistance. No force, however, should be exercised, until the points of the instrument used has fairly engaged in the stricture ; and when once that is penetrated, the cure rests with ourselves. The instruments adopted should be gradually increased in size, as instanced by the detailed treatment of the case with which these remarks are associated. The objects to be secured by treatment are,—the restoration of the channel to its original capacity, and to keep it patent ; but no mechanical attempts at dilatation should be made until rest has been enjoined, and a careful regimen. A chemical and microscopical examination of the urine, will point out the therapeutic measures, to allay urinary irritation, and these should never be neglected. I have already illustrated the immediate relief to be obtained from the smarting pain in the urethra, occasioned by the passage of an instrument, by injecting a solution of the extract of belladonna, and it has been seen, how the anæsthetic influence of chloroform facilitated the introduction of the catheter, which, without it, could never have penetrated the stricture. These, then, are important adjuvants in the hands of the surgeon, by a judicious combination of which, the more serious operations

projected and performed may be dispensed with—I will not say in all cases, but I believe a very few will be found exceptional. The stricture once fairly passed, the dilatation must be very gradual, and the instrument increased in size, until the canal is restored to its normal calibre; but no catheter or bougie must ever be passed larger than the orifice of the meatus. If the patient be placed under chloroform, it is of course necessary, that he should assume a recumbent position; but when the anæsthetic is dispensed with, he is better erect. In consequence, however, of the tendency to faintness sometimes induced, I have, in my consulting-room, two arms, like those of a chair, placed in the wall at a convenient height. On these the patient supports himself, his buttocks resting lightly against the wall, his toes turned outwards, and heels separated.

I have not entered upon the consideration of the various instruments employed,—cat-gut bougies, flexible or inflexible catheters, metallic sounds. The shape and curve of these instruments too, is not unimportant. It will suffice, that my preference is for a solid sound, with a curve, which forms the fourth part of the circumference of a circle, $4\frac{1}{2}$ inches in diameter; its points well rounded, and shape conoid, the base at the bend of the instrument.

Various disquisitions have been made during the last few years, on the subject of "impermeable stricture," and much misunderstanding has resulted. The late Mr. Liston maintained that inability to enter the bladder, through the urethral canal, indicated only incompetency on the part of the surgeon. Since his death, however, Mr. Cadge, formerly house-surgeon to University College Hospital, has averred, that the great operator himself failed more than once, during the latter part of his life. Mr. Syme believes that if urine can be extruded, an instrument can be passed; and has reduced the graduation of his bougies, so that No. 5 of his scale constitutes No. 1 of that ordinarily adopted. He has also invented a tapering bougie, of Berlin silver, probe-pointed. The surgeon, however, must always remember that the difficulty and danger to the urethra, increases in proportion with the diminution in size of the instrument employed. False passages are more readily entered, or even made; and the difficulty increased of keeping the point of the instrument against the upper wall of the urethra, which is the most direct guide to the bladder.

The effective treatment of urethral stricture is not simply dependent upon mechanical dilatation,

but rather upon absorption of the plastic deposit, which constitutes the “*materies morbi*.” To induce this, divers surgeons have adopted measures equally as various. Dupuytren’s method was to promote absorption by keeping up a *uniform* pressure *against* the stricture, and distinguished it by the term “vital dilatation.” It was approved of and adopted by Velpeau and Guthrie. Dr. James Arnott applied his hydrostatic hobby to the same purpose; and, more recently, dilators have been devised and brought into use:—Perreve’s of Paris, improved by Holt, and transcended by Wakley.

Mr. Wakley’s principle applies equally to the treatment of strictures of the rectum, œsophagus, and cervix uteri, and is known as the tubular system. The removal of the stricture can be effected either rapidly or slowly, according to the purpose or intention of the operator; and it is Mr. Wakley’s opinion, that forty-nine out of fifty cases can be cured by his method, without any cutting operation. This tubular treatment is highly commended by many eminent surgeons, amongst whom may be enumerated, Guthrie, Keate, Fergusson, Crampton, Liddell, Solly, Coulson, and Lizars. It is supposed to be “equally applicable to the successful and rapid management of the more simple and common forms

of urethral contractions, as well as of the most severe and intractable cases which occur." In the set of these instruments are three guides of different sizes, numbered respectively 1, 3, and 5. These guides are hollow silver directors, thirteen inches in length, continued straight, until near the end, which is slightly curved, closed, and rounded, and has an aperture at one side. A moveable handle is fitted to the guide, for the purpose of introducing it into the bladder, which is removed when that purpose has been accomplished. A steel rod of the same size, five inches long, is then substituted, and fixed by one turn of a screw, forming a urethral director. In addition to the guides, there are eleven dilating silver tubes, and the same number of flexible tubes of gum-elastic, lined with flexible metal.

The silver tubes are nine inches in length, straight—the vesical extremity being bevelled off, and exactly adjusted to the surface of the guides, over which they are made to pass. Their external end terminates in two flanges, which are worked with the fingers and thumb.

The flexible tubes are ten and a-half inches long, with conical points, and like the silver tubes made to glide over the guide with the utmost precision.

Their upper end is furnished with a silver collar, and rings, to enable their being secured in the urethra. Both the flexible and silver tubes are numbered, and work upon their corresponding guides. The numbers of the guides and tubes exactly correspond with the sizes of the ordinary catheters and bougies. Mr. Wakley's mode of procedure is, first, to examine the urethra with No. 5. guide, and, if it can be introduced, to conduct the treatment of the case upon it. If not, an attempt is made with No. 3; or, this failing, No. 1. If the treatment commences with No. 1 guide, silver tubes to No. 5 are passed. If with No. 3,—to No. 6 or 7, and then the case is completed on No. 5 guide, over which the larger sizes are introduced. When a tube passed over the guide reaches the contraction, a slightly rotatory motion of the handle facilitates its introduction. Having dilated the stricture with this, it is withdrawn; the next sizes passed alternately, until the surgeon considers he has accomplished sufficient for the occasion. The last tube is then tied in by means of a broad india-rubber band, round the root of the penis; the guide is withdrawn, but the tube retained for an hour, the patient meanwhile resuming the recumbent position. Every three days the process is progressively

repeated. The advantages of the tubular treatment, as asserted by Mr. Wakley, are, greater *safety*, *certainty*, and *permanence of cure*. At the same time, he alleges, that the introduction of the tubes is comparatively *painless*,—that it is impossible to cause *hæmorrhage*, or make *false passages* by them, and that they are peculiarly adapted for the *obliteration* of these last.*

Escharotics have at one time or another been much adopted in the treatment of urethral strictures, chiefly the nitrate of silver, and “potassa fusa.” The advocates of these have been—Hunter, Home, Whately, Ducamp, Lallemand, Segalas, Benjamin Philips, and, very lately, Mr. Wade; but now escharotics have, very properly, fallen into desuetude.

Sir B. Brodie has tritely observed, that “the temper of the urethra varies as much as the temper of the mind;” hence the modifications that have been suggested with a view to relieving contractions of its canal. Mr. John Adams, of the London Hospital, believes that the majority of cases may be relieved, without any other surgical interference than that of the catheter; and Mr. Syme views no

* *Lancet*, 1858.

case as *impermeable*, but that with time and care, an instrument may always be passed. Still, simple dilatation has not always afforded effectual relief, and operations have been resorted to with cutting instruments.

Internal and external incisions have been practised; the first by numerous forms of urethrotome,* the principles of all much resembling each other; some, however, cutting as they are pushed through; others, in the act of withdrawal. External incisions are effected by sections of the perineum. M. Civiale, of Paris, though an ardent advocate for internal incision, has very fairly tabulated the dangers incurred by its adoption in his work “De l’Uretrotomie,” viz:—

1. Hæmorrhage.
2. Pain.
3. Irritative fever.
4. Ecchymosis.
5. Local inflammation and tumefaction, with or without discharge.
6. Infiltration of urine.
7. False passages.
8. Inflammation and abscess in different parts of the body.
9. Death.

* Stafford’s, or some modification thereof, usually adopted.

Such an array of disastrous results may well make us pause, and deliberate whether safer measures could not be devised. External incision, in a line corresponding with the raphé of the perineum, on a grooved director, has been proposed by Mr. Syme as a certain and safe method of effectually relieving those strictures that are not amenable to simple dilatation; and this able surgeon had advanced to some eighty or ninety cases before a fatal result led him to modify this assertion. Syme's operation has of late years been so fully and freely ventilated, that it would be a work of supererogation to dwell upon the details, or the various improvements suggested, as regards his staff, by the late Richard Mackenzie, Haynes Walton, Marshall, and lastly, effected by Mr. Syme himself. A very ingenious urethrotome, too, has recently been proposed, and figured in the *Medical Times*, by Mr. Maunder, Demonstrator of Anatomy at Guy's Hospital, for cases where perineal section must be made at hazard, without a director, but with what practical utility I have yet to learn.

Thus we have seen, then, the modes of treating permanent strictures are, by—

1. Dilatation.
2. Caustics.

3. Urethrotomy by internal incision.

4. Urethrotomy by perineal incision.

Of these, the second and third are virtually abandoned. The first holds out every prospect of success, in the majority of cases; and few strictures cannot be rendered permeable, with the ordinary catheters or bougies, by proper constitutional and local treatment, conjoined with anæsthesia,—even when, as in this instance, the effect of traumatic injury.

Still we must presume that strictures will be met with which are impermeable, or which have a tendency to re-contract, and, in such cases, necessitate perineal section. This must also be resorted to where obliteration of the urethra has resulted from traumatic injury; for these are the worst and most intractable kinds of stricture, whether or not associated with perineal fistulæ.

CHAPTER IX.

EXSECTIONS OF THE MAXILLARY BONES.

Two operations—Disease identical in each, viz., Caries—Origin of both, external injury—Effects of inflammation of bone—Suppuration of frequent occurrence, from mechanical injury or constitutional taint—Its limits circumscribed or diffused—Greater danger from the latter—Ulceration—Frequency in young persons—Analogy with similar process in soft parts, and first demonstration by John Hunter—May be of two kinds—Their distinction and treatment—Importance of judicious appellations in the treatment of diseases—Pott's aphorism—Uleer, a product of true inflammation—How excited or induced—Effect of gradual pressure on bone—Analogy with soft parts in the destructive process of ulceration of bone—Dissimilarity in the reparative—No centripetal movement to diminish cavity by contraction—Ultimate diminution by granulation of centres, and interstitial absorption of margins—Coalescence of osseous granules, with granulations of superincumbent soft parts, and establishment of cicatrix—Dr. Bowman's case illustrative of simple ulceration of bone—Caries, a sequence of simple ulcer, or directly produced—Indiscriminate application of the term to all breaches of continuity in bone—Definition of caries—All bones equally obnoxious—Its "nidus," the cancellated texture—Conversion of denser portions of bone into cancellous, by interstitial absorption, and their appearance—Sensation communicated when probe passed into carious cavity—Chronic character of disintegrating process—Nature of its accompanying discharge—Condition of neighbouring soft parts—Sinuses, their varying characteristics—Pecculiarity of pain in the affected part—Its increase and discharge of blood on passing probe, due to granulations of soft parts—Division of the morbid action of caries into three concentric circles: the outer granulating, the intermediate and internal, incapable of reparation—Conditions of the three circles, and processes occurring in each—Disposition of caries into simple, serofulous, and tubercular, previously described—Invariably accompanying constitutional irritation, of the asthenic type—Caries may originate primarily, or be induced secondarily—May be the sequence of ulceration of soft parts, of lupus, of degenerated ulcer of bone, syphilis, mercury—Not comprehended by the

term if following malignant disease—Not to be confounded with necrosis—Indications of treatment to remove internal and intermediate circles—Effected by escharotics and exsection—Potential cautery only applicable—Treatment prior and subsequent to removal of eschar—Superiority of excision—Few situations where it is impracticable—Contemplated operation for removal of two carious ribs—Excisions of portions of superior and inferior maxillary bones—Subject of the first, his birth-place, age, occupation, appearance, temperament, and habits—Previous good health, until occurrence of toothache—Extraction of last molar, by a druggist, with portion of alveolus—Continued patency of cavity—Supervention of purulent discharge—Unsuccessful treatment of several successive medical practitioners—Attendance of Mr. ——— over a period of two years—Aggravation of symptoms and suffering the result—Severity of pain, and its radiations—Fœtid nature of discharge—Insomnolency—Ejection of sanguino-purulent discharge, through anterior nares of affected side—Examination with probe, and resulting diagnosis—Operation—Necessity to elevate head and shoulders of patient—Anæsthesia—Commencement, course, and termination of incision—Avoidance of parotid duct—Profuseness of hæmorrhage—Deligation of arterics—Portions of bone removed—Extent of the disease—Confirmation of diagnosis—Treatment of the cavity—External wound, and angle of the mouth—Union of incision by “first intention”—Healing of cavity by suppuration and granulation—Progress of cure, and complete recovery—Second case implicated inferior maxilla—Subject of the disease, a school-boy—Origin of the injury—Its sequence, and accompaniments—Temporary benefit from removal of two teeth—Return of symptoms, and increase in their severity—Condition of the parts on 4th September—Operation on the 12th—Necessary incision—Its character and extent—Attention to elevation of head and shoulders during operation—Extraction of teeth—Incision—Deligation of arteries—Dissection of gums—Portions of bone excised—Similar treatment to former case of cavity and wound—Followed by strictly antiphlogistic diet and regimen—Eventuating in like healing processes and cure—Importance of retaining base of bone in exsections of inferior maxilla—Advantages derived, and divisions of particular muscles avoided—Intensity of hæmorrhage in both operations—Graefe’s practice of previous deligation of the carotid, superfluous—Circumstances controlling characters of incisions—Syme’s and Miller’s modifications—Names of eminent surgeons, with predilections for special incisions—Their rapid union—Subsequent treatment, through the mouth—Greater propensity of superior maxillary bone to caries than inferior—Demands especial attention, from numerous diseases to which it is liable—Description of bone—Has a body, four processes, and four surfaces; and assists in formation of three cavities, two fossæ, and two fissures—Early origin of exsections of jaws, or diseased portions of them—Diseases for which such exsections were resorted to—Removal of portions or entire jaws, by projectiles—Testimony of

military surgeons—Disputants for the merit of first resorting to exsections of the jaws—Gensoul, Lizars, and Dupuytren—Their claims contested by Hippocrates, Acroluthus, Camper, Ruysch, Planehe, David, Beaupreau, Siebold, Deschamps, Klein—Postulate as to complete regeneration of bones—Negation of many pathologists—Affirmation of Moreau, Chopart, Fowles, Weidemann, Gross, Cusaek—Description of Marshall's Osteotrite—Its superiority, and general applicability.

Two operations of this character have occurred to me, the one shortly following upon the other. The first pertained to the superior, the last to the inferior maxillary bone. The disease was identical in each, viz., caries, as also the object; the removal of so much of the structure as might be implicated in the marked action. Both had their origin, apparently, in external injury, resulting in osteitis. In previous pages, I have taken occasion to descant upon the effects of inflammation of bone. These are, unless resolution occurs,—suppuration, ulceration, or gangrene.

Suppuration is of very common occurrence, especially of the external substance of bones; and it is also met with in the cancellated structure. It may originate simply from mechanical injury, or be determined by constitutional taints. Its limits are either circumscribed, or it is diffused, the latter form being the most dangerous.

Ulceration is generally met with in young persons. I have already pointed out the analogy which

subsists between ulceration of bone and that occurring in the soft textures,—the loss of substance in both arising from molecular disintegration as first demonstrated by John Hunter. Such ulceration may be of two kinds, the distinction being, that one is simple, and amenable to treatment, the other, peculiar, and difficult to cure.

It is of the utmost importance, in discussing the nature of disease, with a view to the judicious application of remedial measures, to remember Pott's aphorism, "that clear and precise definition of disease, and the application of such names to them as are expressive of their true nature, are of more consequence than they are generally imagined to be. Untrue and imperfect ones occasion false ideas, and false ideas are generally followed by erroneous practice."

Referring, then, to ulceration of bone, we recognise it as of two kinds,—the one being simple and benign; the other peculiar, and, though not malignant, very intractable, and possessing no tendency to cure. The first of these we distinguish as ulcer; the second, as caries.

Ulcer is a product of true inflammation, which is invariably the direct cause. This may be excited by traumatic injury, or induced by pressure. Pres-

sure gradually applied to bone, results only in its continuous absorption; a more intense and sudden application thereof is necessary to effect ulceration. The destructive process is, as I have already stated, precisely analogous to the disintegration that occurs in the soft textures; the reparative, however, is not exactly similar. From the hard character of the surrounding bone, the osseous granulations are not so abundant; and, from its inelastic nature, there is no centripetal movement, no contraction, whereby the chasm can be diminished, as in the cicatrix. It does, however, ultimately diminish in depth and extent—becoming somewhat elevated in the centre by osseous granulations, whilst the margins are lowered, or, as it were, bevelled off, by interstitial absorption. The contiguous soft parts are also undergoing reparation by granulations, and these coalesce with the osseous granules underneath, until a permanent and firm, though depressed cicatrix, is established.

By the courtesy of my friend Dr. Bowman, (knowing that I was interested in these researches) I had an opportunity of examining a very illustrative case. A youth, residing at Pentridge, whilst chasing a heifer, was supposed to have fallen. He was conveyed home senseless, and had an incised wound

above and in the line of the right eyebrow, about three inches in length. This, on examination, had penetrated to the bone, dividing the pericranium; but there was no fracture nor depression. He recovered from the effects of the concussion, and the wound united by the first intention. Some few months after, however, he again presented himself to Dr. B., with a fistulous opening in the cicatrix, discharging laudable pus. There was a deep groove along the line of the cicatrix, leading to a deeper excavation at its right terminal extremity, which readily admitted the point of a finger. Gradually the groove filled up, and the excavation has very considerably lessened. The margins, at first, abrupt, have become bevelled down, and the cicatrix would appear entirely and securely healed, but for an occasional exudation of a minute point of pus.

Caries may follow on this simple ulcer, although more frequently it is not a sequence, but exists "*ab initio*." The term has been most indiscriminately applied to all breaches of continuity in bone. We shall arrive, however, at a better and more correct appreciation of its proper nature. It is not a weak ulcer, neither is it a cancerous sore; but "a breach of continuity of a peculiar kind,—itself incapable of

cure, yet not in any degree partaking of true malignity."

Caries affects all bones, and every part of their structure, though its proper "nidus" seems to be the cancellated, into which it converts even the denser portions by interstitial absorption, giving them an eroded, worm-eaten appearance. When not open and uncovered, a probe passed into the cavity, communicates a crumbling sensation, like the breaking down of touchwood.

The disintegrating process is usually of a very chronic character, and accompanied by a thin, fœtid, acrid, sanguineo-purulent, discharge. The surrounding soft parts are swollen by infiltration of their tissues, and one or more apertures, or sinuses exist, with the varying characteristics of what are systematically recognised as weak, scrofulous, irritable, or inflamed ulcers. If there is a direct opening, the probe readily passes, and, with the slightest effort, sinks into the bone, conveying the sensation, as before stated, of decayed woody fibre. Although there is generally pain in the part of a smarting character, the probe usually passes without any aggravation of the same. If the pain be increased, and blood issues from the track of the probe, it is due to the weak and tender granulations of the soft parts.

That portion of bone which is subject to the morbid action of caries, has been considered as divisible into three concentric circles,—the external one engaged in the formation of new osseous matter; the intermediate and internal—both incapable of any process of reparation.

The internal circle is composed of the carious cavity; the intermediate is in a transition state of interstitial absorption, and presents a cribriform or worm-eaten appearance; whilst the outer areola is sufficiently sound, for the reproduction of osseous granules.

Caries has also been considered,—1. Simple; 2. Scrofulous; 3. Tubercular, in character, as I have elsewhere described. In whatever form it occurs, the system must suffer (to a greater or less extent, it is true,) and the disorder is invariably of the asthenic type. It may originate primarily, or be induced secondarily, the bone not being at first involved. Infiltration and suppuration of the soft parts; an intractable ulcer, like lupus; degeneration of previous simple ulcer of the bone; syphilis; the abuse of mercury;—all may prepare the occurrence of true caries. Disease of bone, however, consequent on a malignant affection of the soft parts, is malignant; it is not comprehended by the above term.

Neither must it be confounded with necrosis. Although the latter is frequently accompanied by the former, they are as distinct from each other as ulceration from mortification, in the soft parts,—necrosis being the death of a bone, or some part of it, from causes, external or internal, which have destroyed its vitality.

In the treatment of caries, the indications are, to remove such parts as are incapable of healthy action, and leave those possessing reparative powers. To remove, in short, the internal and intermediate circles, (the truly ulcerous, and the interstitially absorbed) leaving the external ones, which is throwing out ossific granules. This is to be effected by escharotics, actual and potential, or excision. The actual cautery, however, destroys too much; it is impossible to limit it to the diseased structures. The adaptation of the potential has been more in vogue; the red oxide of mercury, in powder, or, still more generally, the chloride of lime in paste. After the removal of the escharotic, the cavity is filled with lint, and a poultice applied. When the eschar separates, the surface of the bone is treated as a simple ulcer, and healed as quickly as possible. But excision is much to be preferred; and there must be few situations where it is impracticable.

I have in contemplation, and, indeed, arranged, to remove two carious ribs from a boy; and have recently excised a considerable portion both of the superior and inferior maxillary bones.

The subject of the first of these, was Mr. John M., a Hanoverian by birth, 28 years of age, and pursuing the avocation of a carrier to the "diggings." He was a strong, active man, of sanguine temperament, and temperate habits. He had always enjoyed good health, but three years previously to consulting me, had suffered severely from toothache, the offender being the last molar. A druggist in Melbourne ventured on its extraction, and, after repeated efforts, brought it out, with a portion of the alveolus attached. The void left never closed; but this was considered unimportant, until a purulent discharge supervened, when several medical practitioners were successively, but not successfully, consulted. Recourse was then had to one of our hospital-surgeons, whose attendance extended over a period of two years, with more unfavourable results. The patient became worse, the discharge very foetid and offensive, with great pain, suffering, and insomnolency. "Au desespoir," I received him, with this antecedent history, and a present distressing narrative,

the chief point of which was great pain in the upper jaw, extending to the eyeball, and affecting also the infra-orbital region. The opened mouth showed a large chasm on the right side, whence the last molar had been removed. From this, pus of a very fœtid character was continuously exuding. Blood and pus too, it was related, frequently escaped through the anterior nares, especially during the use of lotions which had been prescribed. Being introduced into his mouth, he had the power of drawing these fluids through the opening into the antrum, and then ejecting them from the nostril of the same side. Through this opening, too, a probe passed freely into the antrum, anteriorly and posteriorly, sinking into its structures with the peculiar sensation caries imparts.

My diagnosis, then, was—

CARIES.

a. Of alveolar process, and outer wall of antrum—
certain.

b. Of spongy, palatine, and malar bones—dubious.

Diagnosis, and prognosis, equally determined excision, and I advised the removal,

First, Of the outer wall of the antrum ; and

Secondly, If bones further diseased, the exsection
of the superior maxillary bone in its entirety.

This occurred on the 6th August, 1859; and the operation being eagerly assented to, was performed on the 24th of the same month. In this, I was assisted by Drs. Bowman and Robertson, Mr. Plummer, chemist, also being present, and doing good service. The patient was brought into a large, well-lighted room, and laid upon a table, with the head and shoulders elevated, to favour the outward escape of blood, and guard against asphyxia, from its accumulation in the air passages. As soon as advised by Dr. Bowman, that he was fully under the influence of chloroform, I removed the two molar, bicuspid, and canine teeth, of the affected side. I then commenced an incision through the cheek, beginning at the right commissure of the lips, carrying it obliquely upwards, outwards, and backwards, terminating at the zigoma, between the external orbital angle and the ear,—thus avoiding the parotid duct. Great hæmorrhage ensued, and necessitated the deligation of three large branches of the facial artery. The lower portion of the malar bone, and the entire length of the outer wall of the antrum, was then sawn through, and detached with the aid of the cutting pliers. The disease, as anticipated, was confined to the alveolus, and the outer wall of the antrum. All diseased portions,

and spiculæ, were removed—the cavity stuffed with lint, and the external wound through the cheek brought into close apposition by interrupted sutures, whilst the angle of the mouth, formed by the junction of the lips, was accurately adjusted by means of a pin, and twisted suture. Compresses and roller being carefully applied, the chloroform was withdrawn, wine and water administered, the patient carried into an adjoining room, and placed in bed, where he remained three weeks. The outer wound united by the first intention; the cavity of the bone healed by suppuration and granulation. No untoward symptom supervened, and he has resumed his occupation—free from suffering, and the offensive discharge.

The second case, to which I alluded, implicated the lower maxilla. Master William S., æt. $9\frac{1}{2}$, at school, on the banks of the Yarra Yarra, some nine months previous to operation, whilst running in the playground, stumbled and fell against the stump of a tree, striking the right half of the lower jaw severely. Pain and swelling soon followed, attended by a discharge of pus from the alveolus, between the first molar and the canine tooth of the affected side. Both of these I removed, with temporary benefit. The symptoms, however, returned,

and increased in severity; and on the 4th September, 1859, he presented a firm, oblong swelling on the right half of the inferior maxilla; a fœtid discharge was escaping from the alveolus, where it primarily appeared, and the lad was suffering great pain. Joined to this, the probe introduced into the cavity, out of which the pus was welling, communicated the carious sensation. I, therefore, recommended exsection, and performed the operation on the 12th of the same month. Dr. Bowman again rendered me valuable service; and the operation occurring at Brunswick, Mr. George, a druggist in that neighbourhood, was present, and gave active and useful assistance. Finding it would be impossible to get sufficiently at the diseased structure, by the natural opening of the mouth, an incision through the cheek, of similar character, but less extent, than that in the preceding operation, was determined on. The boy was placed upon a table, reclining, with the head and shoulders elevated, on account of the precautions already urged, and anæsthetized by chloroform. The second molar and first incisor teeth were removed, and an incision made from the right commissure of the lips through the cheek, to the extent of about two inches. The bleeding arteries being deligated,

the gum was dissected back—by the saw and pliers, the alveolus and upper half of the inferior maxillary bone, for its anterior two-thirds, were removed, and all carious portions separated further by the gouge. The base of the jaw, being free from disease, was left intact,—the cavity stuffed—the wound closed by interrupted sutures—the commissure, by a pin and twisted suture. Strict confinement to bed, antiphlogistic diet and regimen, were enjoined. The wound healed by the first intention; the cavity suppurated and granulated; discharge and pain ceased; and the boy is now running about quite well. In exsections of the lower jaw, it is of great importance to preserve the base of the bone; the advantage being that there is less deformity than when the entire parts are removed. The attachments of the tongue are not divided; and we avoid cutting the digastric muscle, the mylo-hyoid, the genio-hyoid, and the genio-hyoglossus. The base remaining, it is also of further importance, by affording a rest for the adaptation of false teeth. In both operations, the incisions through the cheeks were accompanied by profuse bleeding. From the smaller vessels it soon ceased, and the facial and larger branches were readily commanded by the fingers, until the necessary ligatures were

applied. But, however profuse the hæmorrhage, there can be no necessity for tying the carotid, as has been practised by Græfe and others. With regard to the incisions through the integuments, circumstances must, of course, considerably modify them; and good reasons have been alleged by eminent surgeons, for their several modifications. Mr. Syme makes a crucial incision; Professor Miller, two—dissecting the flap between them; Dieffenbach, Gensoul, Warren, Velpeau, O'Shaugnessy, Ballingall, Lizars, Liston, each have their peculiar modes. These incisions reunite readily enough by the first intention, but the interior has to heal by suppuration and granulation, so that all subsequent treatment is through the mouth.

The superior maxillary bone is more prone to caries than the inferior. Indeed, it is more liable to a number of diseases, and so demands especial attention. With the exception of the lower jaw, it is the largest, and certainly it is the most important bone of the face, forming, with its fellow of the opposite side, the upper jaw. It assists in the formation of three cavities—the roof of the mouth the floor and outer wall of the nares, and the floor of the orbit. It enters into the formation of two fossæ—the zigomatic, and the speno-maxillary;

of two fissures—the sphenoid, and the pterigo-maxillary. The body of the bone, quadrilateral in shape, and hollowed in the interior, forms the antrum of Highmore, and has four processes—the malar, nasal, alveolar, and palatine. Lastly, it has four surfaces—an external, or facial; posterior, or zygomatic; superior, or orbital; and an internal, which bounds the maxillary sinus, or antrum of Highmore.

Exsections of the jaws, or diseased portions of them, have been performed from a very early period, and for many different causes, sarcoma, caries, fungus, necrosis, cavernous exostosis, cancer, tumours, and injuries from firearms.

The jaws, or portions of them, have also been violently removed by projectiles, as numerous instances, recorded by military surgeons, testify.

Gensoul claims the merit of first resorting to exsection, as a surgical operation; Lizars maintains his priority; and Dupuytren disputes the honour with both. But these claims of modern surgeons may be still further denied by the great father of medicine, Hippocrates himself, and by Aculuthus, who performed it in 1693. So also, Camper relates it, Ruysch, for fungous excrescence; Planche, sarcoma; fungus of sinus, David, Beauprean; tumour, Siebold, Deschamps, Klein.

The postulate has been demanded—are bones ever completely regenerated? Whilst this is denied by certain pathologists, others maintain its occurrence. Among the latter, Moreau affirms having seen a case of complete regeneration of the clavicle; Chopart, of the scapula; Fowles, the ulna; Weidemann, the lower jaw; Gross narrates one case, where Mr. Cusack, of Dublin, had removed the left half of the inferior maxilla, and four years afterwards it was fully reproduced. Also a second, in which the upper part of the astragalus was completely regenerated. These cases are sufficient in themselves to decide the question, whatever negation they may receive elsewhere.

Before closing this memoir, I would briefly refer to the invention of an admirable osteotrite, for which we are indebted to Mr. Marshall, of London, and which is described in the *Lancet* for June, 1857. It is in every way superior to the gouge in ordinary use, having, like it, a handle into which a steel shaft is fixed. This shaft, however, terminates in a round, somewhat conical, or acorn-like head, with a series of spiral cutting edges, radiating from two points on the sides of the vertex. Between these apices, are two or three other spirals, continued *across* the head. The grooves between

these spiral edges are deep, and about an eighth of an inch apart. The teeth thus formed, are sharp, and turned to the right. Three sizes of this instrument are made, and it is about the length of the ordinary gouge. It is used by a rotatory movement of the wrist, cutting like a saw or rasp, and leaves no loose splinters. The sensation communicated to the hand indicates when the diseased portions are removed, and it is in contact with healthy bone.

CHAPTER X.

ANÆSTHESIA.

Conservative character of anæsthetics, à propôs to these contributions—

Propriety or impropriety of inducing anæsthesia, no longer a matter of opinion—Proof of their power to annul pain—"Numerical method"—Adverse statistics of Arnott and Fenwick—Use and abuse of statistics—Objections to inductions of anæsthesia, on religious grounds—Happy designation of objectors, by Dr. Chalmers—Denounced from pulpit, as vaccination formerly was—Less annual deaths from small-pox than fifty years ago—Professor Simpson's admirable settlement of the religious aspects of the question—"The first surgical operation"—Translation of Hebraic account thereof—Rendering of original into Greek and Latin—The primeval curse; its triple character—Curse not immutable—Anti-vaccinarian societies—Moral aspect of anæsthesia; impudicity of Gream and others—Ridiculous proposition of pseudo-moralists as regards pain—Aim and scope of science of medicine—Inductions of anæsthesia not an idea of modern times—Drugs employed at various times—Earliest records of attempts to relieve pain, by the mandrake—Natural history of atropa mandragora—Used as a wine, and as a cake—Precedence of the Chinese in induction of anæsthesia by inhalation—Hoatho, the first Chinese physician, who resorted to it—Period at which he flourished, and agent employed by him—Opium common in most remote periods—Inhalation of fumes of hemp by the Hindoos—The "Hasehisch" of the Moslem—Mesmerism, hypnotism—Suggestion of nitrous oxide as a letheon, by Sir Humphrey Davey—Induction of anæsthesia, first a "fait accompli" in 1846—Egyptian nepenthes—Memphian stone—Mandrake wine—Mongolian opium-eating—Moslem "haschisch"—Hysteric catalepsy—"Laughing-gas"—Compression of nerves—Congelation—Culminating in etherization, by Morton—Early endeavour to keep the agent secret betrayed by its odour—First employment in London, by Mr. Robinson, at Dr. Boots—Successful adoption by Liston and Velpeau—Professor Simpson's early application of new letheon during parturition—His further experiments with other agents, and suggestion to him of chloroform by Mr. Waldie of Liverpool—"Greatest discovery in modern surgery"—Trial of other volatile agents, amylene, chloric-ether—Almost universal adoption of chloroform, for diagnostic and other purposes; surgical, obstetrical, and medical—Ether still employed in Massa-

chusetts General Hospital; chloroform there tabooed—Simultaneous discovery of chloroform by Soubeiran, Liebig, and Guthrie—Determination of its true chemical composition subsequently by Dumas and Peligot—First object of inquiries, and experiments as to its nature—Professor Simpson's discovery of its anæsthetic properties by inhalation, in 1847—Formic acid first pointed out as a peculiar acid by Gehlen; artificially prepared by Doebereiner—Various processes for obtaining it—Methods of obtaining chloroform, most convenient and best, adopted by London Pharmacopeia—Trade supplied by druggists in Edinburgh—Several volatile substances proposed as anæsthetics since discovery of chloroform—Amylene, first employed by Snow, in London; subsequently used extensively on the continent of Europe, but fallen into desuetude—Properties of amylene—M. Girald's grounds for superiority of amylene as an anæsthetic for children—Inhalation of chloric-ether—Cause of its abandonment—Its analogous relation to chloroform—Chloroform, analogous in chemical composition to ether and alcohol—Designations of Liebig, London Pharmacopeia, and Dumas—Dumas' universally recognised—Nature and properties of chloroform—Effect of temperature, during inhalation, of practical importance—Soluble in alcohol and ether; slight affinity for water—An useful solvent of many bodies for purposes of arts and manufactures—Most volatile liquid employed in medicine, with the exceptions of ether and amylene—Aptitude for spontaneous decomposition, especially in warm climates—Necessary precautions—Alleged impurities—Tests, for purity, the presence of sulphuric acid, alcohol—Mialhe's test for alcohol—Snow's confirmation—Therapeutic history—Internal administration as a diffusible stimulant, antispasmodic, narcotic—Dose, proper vehicle and mode of prescription—Necessary discrimination between "drop" and "minim"—Liquid chloroform, not an active poison—Recorded case—External use, and proportion—Dr. Headland's disposition of chloroform; its physiological action when inhaled, inebriant, anæsthetic—Enumeration of *medical* cases for which inhalation is employed; antispasmodic; anodyne; diffusible and contra-stimulant; topical application—Inhalation in obstetric practice, not full in ordinary parturition, deepened in obstetric operations—Statements of Drs. Rigby and Bowman—Bowman's employment of it as an emmenagogue—Value of inhalation in military surgery—Forensic medicine—Surgical examinations and explorations, &c.—Opens a wider field for conservative surgery—Inhalation not to be entrusted to inexperienced persons—Should occupy entire attention of chloroformist—Conditions essential to successful anæsthesia—Mode of absorption of vapours, and rapid transmission into circulation—Snow's calculation of amount of vapour necessary to be absorbed before inducing effect—Free access of atmospheric air essential, whatever apparatus employed—Being a narcotico-irritant when inhaled—Narcotism should be insidiously induced, otherwise attended with danger—Mode of application, and phenomena before complete insensibility—Action on the pulse; voluntary muscles; pupils—Tests of full anæstheti-

zation—Period of withdrawal of vapour, and indications for commencement of incision—Headland's division of its action into three *states*—Snow's into *degrees*, of which there are five—Phenomena of each of these divisions—Order in which the nervous centres are affected, according to Flourens—Not necessary to extend narcotism beyond *third degree*—Number of minims to be absorbed for its induction; for that of the fourth; and for the arrest of respiration—Much more apparently administered, but is not absorbed—Average period of consciousness after commencement of inhalation—Prolonged from nervous dread, or pungency of vapours—Time required to produce insensibility, and for return of consciousness—Salivation—Precaution—Importance of not conversing with patient—Vomiting an occasional sequence—Considerable hæmorrhage necessitates a stimulant—Predominance of advantages over risk—Results of Snow's experiments, as to saturation of air with vapour of chloroform at different temperatures—Death by *sideration*—Distinction between cardiac and anæmic syncope—Duties of chloroformist, to obviate danger—Snow's admixture, with an equal proportion of alcohol—Atmospheric air, the best diluent—Means of restoring suspended animation—Insignificance of proportion of deaths from chloroform—Total population of the United Kingdom, United States, France, and Germany—Number of capital operations in surgery performed therein, and resulting fatality—Death occurs from paralysis of heart—Ganglionic system affected only in fifth degree—Age no objection—Favourable effect upon children, and peculiar sequence—Slower subsidence of effects upon aged persons; not contra-indicated by hysteria, pregnancy, menstruation, diseases of lungs or heart, hard drinkers, idiosyncrasy, fear—Apparatus—Quantity—Combinations with ether or alcohol undesirable—Indications for necessity of repetition—No tolerance established by continued use—No persons proof against its full influence—Anti-hæmorrhagic power—Superiority of chloroform over ether—Safety of inhalation in operations on mouth, fauces, and jaws—Precautions antecedent to an operation during its performance, and subsequently—Conclusion.

No condition associated with the science of surgery can be more strictly deemed conservative than the employment of anæsthetics. Some remarks, therefore, upon the nature and effects of such agents cannot be *mal apropos* to these contributions. Ample proof has been given of their power to annul pain, whether attendant on surgical operations, the

physiological action of parturition, or resulting from pathological conditions. The propriety or impropriety of inducing anæsthesia is no longer a mere matter of opinion, or dependent upon *a priori* reasoning. Neither can it be settled by the "numerical method," as is now attempted by an array of adverse statistics, emanating from Dr. James Arnott, of London, and Mr. Fenwick, of Newcastle. There is an use, but there is also an abuse, of statistics; they are capable of being perverted or utilized, as prejudice, or its opposite, may determine; and neither of these gentlemen are exempt from the suspicion of advancing a favourite hobby, to the prejudice of the agent most extensively employed. The induction of anæsthesia has also been objected to on religious grounds by some "small theologians," as they were happily designated by the late Rev. Dr. Chalmers, of Edinburgh. It has even been denounced from the pulpit; in the same manner as the prior inestimable boon to humanity—Vaccination—first publicly promulgated by the immortal Jenner, in 1798. From this discovery (which has been the ægis of millions, inasmuch as some 500,000 deaths less annually occur in Europe from small-pox than fifty years ago) it was prophesied that bestial humours would be propagated;

and averred, that those who had undergone the process, “coughed like cows,” and “bellowed like bulls.” As regards the employment of anæsthetics, the religious aspect of the question has been ably met by Professor Simpson, whose Hebraic lore, biblical erudition, analogical reasoning, and logical deductions, would satisfy the most scrupulous and bigoted. Nay, it even claims a Divine origin, for “God caused a *deep* sleep to fall upon Adam,” during what the learned doctor has spoken of—I write it reverently—as “the first surgical operation.” The Hebrew words from which “deep sleep” is translated, signify “the deepest form of *induced* slumber.” These, again, are rendered, in the early Greek translation of the Bible by Aquila, into an expression which Hippocrates, Galen, Ætius, and other Greek physicians, employed to indicate coma or lethargy. In the further embodiment of the Bible in the Latin tongue, the same circumstances and condition are conveyed by the words “*profundo sopore*.”

But the “small theologians” have especially taken their stand against the annulling of pain during parturition, as abrogating the primæval curse; and Dr. Simpson has again demonstrated the untenable nature of the ground they occupy. The primæval

curse was of a triple character—a judgment upon the serpent, the woman, and the ground; and it is easily proven that, as regards the two last at least, the curse was not immutable. Here, again, the Hebraic erudition and biblical research of the distinguished Edinburgh professor insures him a triumphant refutation of the allegation of “endeavouring to pervert the fiat of the Deity.” As, on the discovery of vaccination, anti-vaccinarian societies were established, at which eminent physicians and learned professors denounced its practice, so learned professors and distinguished physicians have not been wanting to denounce anæsthetics.

In addition to the religious aspects of the question, it has also assumed a moral type. The assertions of Dr. Gream and others—that anæsthetic agents engendered impure thoughts, and excited impure actions and expressions—never had foundation, except in the depraved conceptions of their reporters.

Other pseudo-moralists have pronounced that to annul pain was unnecessary and improper, because pain would not occur except as a safeguard, by some wise provision of Nature. So ridiculous a proposition needs no refutation. It is natural to

the Aboriginal *habitans* of the Australian continent to dance “corroborees” without superfluous raiment; but our modern beaux, who are “native, and to the manner born,” could scarcely so “thread the mazes of the giddy dance,” though “quite colonial.” The history of the world, the progress of civilization, is antagonistic to such “natural laws,” and the whole aim and scope of the science of medicine, from the most remote periods, has been to lessen human suffering and mitigate pain.

The induction of anæsthesia is by no means an idea of modern times. It has furnished material for the romancist, as well as being desired by the surgeon. Many agents or drugs have been used at different times to induce insensibility,—the atropa mandragora, the cannabis sativa, var. Indica, opium, &c. The earliest records of attempts to relieve pain during surgical operations are from the days of the Roman Empire, and mandragora appears to have been the agent employed. The mandrake belongs to the natural order Solanaceæ. Dioscorides, physician to Anthony and Cleopatra, Pliny, and Apulieus, described a wine of mandragora; other writers refer to a cake possessing narcotic properties. The Chinese, who anticipated Caxton in the art of printing, as well as the discovery of gun-

powder, have also preceded us in the induction of anæsthesia by inhalation, according to Mr. Stanislaus Julien. Hoatho was the name of the Chinese physician who resorted to anæsthetics; between 220 and 230 of our era was the time he flourished; and the agent used by him was a preparation of hemp. The practice of taking opium was common in the most remote periods. The Hindoos have long been known to inhale the fumes of hemp. The *haschisch* has for ages transported the Moslem to the gates of his future paradise, and yielded him brief dalliance with its bright-eyed houris. Mesmer and his followers have reported themselves as "steeping the senses in sweet oblivion;" whilst hypnotism has revelled in the inventive faculty of Mr. Braid, of Manchester, and the asseverations of Dr. Esdaile, in India. Upwards of fifty years ago, Sir Humphrey Davy suggested the nitrous oxide as a letheon. Each and all of these agents and influences have been employed during surgical operations, to annul the pain consequent on them. But it was not until 1846 that the induction of anæsthesia became a *fait accompli*; and that year heralded the completion of a discovery, next in importance to vaccination.

The effects of the Egyptian nepenthes on

Ulysses and his followers; the "stone of Memphis," and its oracular results; the wine of mandrake; the opium-eating Mongol; the dreaming Moslem; the hysteric catalepsy of the Mesmeric imposture; the "laughing gas;" compression of the nerves; congelation;—all culminated in the exhibition of ether, by Mr. Morton, at Boston, U.S., on the 30th September, 1846, and created a new era in the history of medical science. At first, it was endeavoured to be kept secret what was the agent employed; but its powerful odour betrayed it to Dr. Bigelow, who straightway communicated it to his compatriot medical brethren, and to Dr. Boot, of London, at whose house it was first administered by Mr. Robinson, dentist, for the extraction of a tooth. It was then successfully employed by Mr. Liston, in his operations, at University College Hospital; and a few days after, by M. Velpeau, in Paris. A month subsequently, Professor Simpson, in Edinburgh, availed himself of the new letheon to assuage the throes of parturition, and applied himself to the examination of other narcotic substances, which might be superior to ether, or free from some of its objectionable qualities. In the course of these experiments, Mr. Waldie, of the Apothecaries' Hall, Liverpool, informed Dr. Simpson

of the existence and nature of chloroform, and predicted its effects. The distinguished obstetrician, ever foremost to mitigate human suffering, having satisfied himself of the properties of the new agent, displayed it to the profession, not only as eclipsing ether, but “as the greatest discovery in modern surgery”—so characterised by Professor Fergusson.

Other volatile agents have since been tried—chloric ether, amylene,—but chloroform continues to be almost universally employed for diagnostic and other purposes, surgical, obstetrical, and medical. Ether, however, is still resorted to in the Massachusetts General Hospital, where it was first used; chloroform being there *tabooed*.

Chloroform was almost simultaneously discovered by Soubeiran in France, Liebig in Germany, and Guthrie in America, during the years 1831-32; but it was not until 1834-35, that Dumas and Peligot determined accurately its true chemical composition. The first object of inquiries and experiments as to the nature of chloroform, was the investigation of a point in philosophical chemistry; there was no idea of adapting it to any practical purpose, until Dr. Simpson's discovery, in the early part of 1847, of its anæsthetic properties when used by inhalation

Chloroform is the perchloride of formyle; formyle being the hypothetical radical of formic acid, first discovered in the red ant (*Formica Rufa*)—hence its name—by Gehlen, who pointed it out as a peculiar acid; and it was afterwards artificially prepared by Doebereiner. A variety of processes have since been devised by chemists for obtaining formic acid; from starch, sugar, and many other vegetable substances.

A series of chlorides of formyle may be produced by bringing chlorine and the hypochlorites to act on the chloride, oxide, and hydrated oxide of methyle (pyroxylic, or wood spirit). Chloroform can also be made and obtained by various processes:—

1. By distillation of a mixture of diluted spirit, pyroxylic or wood spirit, or acetone—and chloride of lime.

2. By making milk of lime, or an aqueous solution of caustic alkali, act upon chloral.

3. By leading a stream of chlorine gas, into a solution of caustic potash, in spirits of wine.

The most convenient, and that which yields it in the greatest purity has been adopted by the London Pharmacopœia. The London druggists, however, have almost ceased to make chloroform, finding it cheaper to be supplied by the trade in Edinburgh,

where the spirit duties are much lower than in England. So that, with whatever name a specimen of chloroform may be associated, to stamp it as a genuine article, it is a fact, that nearly all employed in Great Britain and the colonies is manufactured in Edinburgh.

Several volatile substances have been proposed as anæsthetics since the introduction of chloroform, but none have superseded it, nor even come into use, with the exception of amylene. Among these, we have heard of chloride of hydrocarbon, better known as "Dutch liquid;" nitrate of the oxide of ethyle; benzin, or benzole, designated by Faraday bicarburet of hydrogen; aldehyde, or hydrate of the oxide of acetylene; bisulphuret of carbon, or alcohol of sulphur. Amylene was first employed by the late Dr. Snow, of London, at King's College Hospital, in November, 1856; and subsequently used extensively in Paris, Strasbourg, Lyons, and other places on the Continent of Europe; but it has fallen into desuetude. It was discovered in 1844, by M. Ballard, Professor of Chemistry, Faculty of Sciences, Paris; and is made by distilling amylic alcohol with chloride of zinc. Amylic alcohol is obtained from crude fusel oil, or oil of potato spirit; and amylene, from amylic alcohol, by dishydrating spirits. Dr.

Snow appears to have had a considerable predilection for this agent, but as there was no method of obtaining it free from the products which come over with it, except repeated distillation, it was rendered too expensive. Amylene is a colourless, mobile, and very volatile fluid, of low specific gravity, with more odour than chloroform, but less than ether. This odour somewhat resembles naphtha. It is almost tasteless, and its vapour is free from pungency.

M. Giraldis advances the superiority of amylene as an anæsthetic for children, on the grounds—

1. That having no pungency, it is respired more easily.

2. Anæsthesia occurs more rapidly.

3. The induced sleep is calmer, natural, and unaccompanied by stertor.

4. There is a more rapid return to consciousness.

5. No nausea, vomiting, or cerebral congestion, is induced.

6. No subsequent inconvenient results.

Chloric ether, a solution of chloroform in spirits of wine, has also been administered by inhalation, but abandoned, on account of its frequent failure and expense. It bears the analogous relation to chloroform that laudanum does to opium. Dr. Snow

found that when inhaled, its anæsthetic properties were due to a volatile body—hydrochloric ether,—which evaporated, and left behind a large quantity of spirits of wine.

As chloroform, then, still retains its popularity, and is almost universally adopted for anæsthetic purposes, we will especially consider its nature, properties, effects, modes of administration, attendant casualties, applicability, and risk.

It is analogous in chemical composition to ether and alcohol, as the subjoined symbols of equivalents demonstrate :—



Chloroform consists, then, of two atoms of carbon, one of hydrogen, and three of chlorine; or it may be expressed as, one atom of formyle, with three of chlorine, and symbolized by the formula, $Co Cl_3$. Liebig designated it a perchloride of formyle; the London Pharmacopœia calls it chloroformyl; but it is universally recognised by the term, for which Dumas is sponsor, chloroform. It is a clear, limpid, dense, colourless fluid, with a saccharine taste, and a fragrant, fruit-like odour, which is not persistent. It is not inflammable, but a paper moistened with it, and

introduced into a flame, will be destroyed, with the evolution of smoke and chlorine. It boils at 141° Fahr.; and has a specific gravity of 1.480—half as heavy again as distilled water. Very vaporizable, whilst the density of its vapour is 4.2, at a temperature of 60° ,—or more than four times heavier than atmospheric air—a knowledge of which fact is important in a practical point of view. The vapour of chloroform cannot exist pure, save under pressure of an air-pump, or at a temperature of 140° . Except under such circumstances it cannot exist, *per se*, it must be mixed with atmospheric air. During inhalation, the effect of temperature is of the utmost practical importance, inasmuch as the quantity of vapour commingled with the air will depend on the elastic force of the vapour at different temperatures. For example, if the air inhaled be half saturated with the vapour, and the temperature of the apartment ranges at 50° , the air will contain four per centum of the vapour. Elevate the temperature to 70° , however, the proportion of vapour will be nine per centum.

Chloroform is soluble in alcohol and ether, in all proportions; but has very little affinity for water, being soluble in it, only in the proportion of 1 to 288 times its volume. But chloroform is an active

solvent of many bodies, and therefore useful in the arts and manufactures; camphor, caoutchouc, gutta serena, wax, resin, iodine, &c., all readily undergo solution in it. With the exception of amylene and ether, chloroform is the most volatile liquid employed in medicine, and very apt spontaneously to decompose, especially in warm climates; it should, therefore, be kept in closely-stoppered bottles, protected from the influence of light, and in a cool place.

Some specimens of chloroform are too weak, and therefore unfit for use; whilst the pungency of others is so great, from the presence of too much free chlorine, that it is impossible to continue their inhalation, on account of the coughing and pulmonary irritation produced.

As regards the alleged impurities and adulteration of chloroform, and the risks thereon attendant, there has been considerable anxiety. But the only article that can be mixed with it, without changing its appearance and peculiar odour, is alcohol. There are two liquids, certainly, which resemble chloroform in smell, viz., Dutch liquid, and the chlorinated products of hydrochloric ether; but there is no probability of their being substituted, as they are considerably more difficult to prepare.

Mr. Letheby, of London, has stated that some specimens of chloroform in the market contain, besides hydrochloric acid, aldehyde, hydrochloric ether, and hypochlorous acid. We have, however, a ready and excellent test for its purity in the smell, and when dropped upon the hand it should quickly evaporate, leaving no odour, nor moisture. Should a disagreeable odour remain, it is unfit for medicinal purposes, having been made from an impure spirit—wood spirit, or acetone. It may become decomposed, but, from whatever cause, it is at once apparent, for it acquires a greenish-yellow colour, and gives off chlorine and hydrochloric acid. This last may be detected by moistening a slip of blue litmus paper with distilled water, and holding it just within the neck of the bottle. When chloroform is pure it is neutral, therefore there is no reaction on test-paper. If sulphuric acid be present, nitrate of baryta will detect it. Alcohol is betrayed by reduction in the specific gravity, and by its acquiring a milky opacity. If present in considerable quantity, place a little chloroform in a graduated tube, and add water. The volume will be diminished, owing to the water abstracting the alcohol. Mialhe looked upon opacity as a very delicate test of the admixture with alcohol; and Snow found that

it was so rendered by the addition of two per centum. Another test of the presence of alcohol is, by engendering heat when shaken with an equal quantity of sulphuric acid, in a stoppered vial, whilst its purity is further proved by no colour being imparted to either liquid after twelve hours. Such, then, are the physical and chemical properties of chloroform. Its therapeutic history indicates that it has been exhibited internally in the fluid form, used externally as a liniment, and its vapour inhaled. Internally, it has been administered for asthma (Guillot), as a diffusible stimulant (Formby), and as a narcotic where opium is contra-indicated; for instance, in hemierania and senile bronchitis, with profuse secretion. The dose is from five to forty minims, as required effects indicate, and the proper vehicle is mucilage of acacia or tragacanth. It should be prescribed in draughts, on account of its volatibility. Being so mobile a liquid, precaution must be taken not to use the words "drop" and "minim" indiscriminately, because there are three drops to one grain. A minim weighs one grain and a-half, consequently, there are *nine drops in two minims of chloroform*.

Liquid chloroform cannot be considered an active poison. When taken in a large dose, it affects the

system like alcohol. A case is recorded, where a man swallowed four ounces, and walked a considerable distance afterwards. He subsequently became comatose, with dilated pupils, stertorous breathing, cold skin, and general convulsions; notwithstanding which, he recovered in five days.

Used externally, it is in the proportion of one to four drams, with half-a-pound of liniment; or, five to thirty minims for one ounce of liniment.

The following arrangement has been adopted in the disposition of chloroform, by Dr. Headland:—

Class II. Division 2nd. Order 1.—Narcotica Inebriantia.

Class IV. Order 5.—Diaphoretica.

Class IV. Order 6.—Diuretica.

Physiologically, then, chloroform is an inebriant, but it is employed to effect two important objects, which are coincident with, or immediately follow, the production of inebriation—an anæsthetic influence on the sensory nerves, and paralysis of the muscular system; and these are obtained by the inhalation of its vapour. Inhalation is so much of the act of breathing as draws the air into the lungs—the method adopted in smoking amongst Eastern nations, a very different process to “smoking” in Western Europe, America, and in these Colonies.

Inhalation of the vapour of chloroform has been employed in medical cases—

1. As an antispasmodic: in asthma, laryngismus, whooping-cough, tetanus, infantile and puerperal convulsions, epilepsy, chorea, colic, dysmenorrhœa, passage of biliary calculi, &c.

2. Anodyne, or narcotic: in neuralgia, delirium cum tremore, delirium in fever, dementia, puerperal mania, hydrocephalus, hysterical paralysis and contractions.

3. Diffusible stimulant: to arrest outset of ague, ephemera, hysteria, sick-headache, &c.

4. Contra-stimulant: in inflammatory diseases, especially those of a painful kind, as rheumatism.

5. Topical applications: in diseases of skin and mucous membranes.

Inhalation of the vapour of chloroform has also been extensively resorted to in obstetric practice, during natural labour; for the purpose of early examination in cases of placenta prævia, and preternatural presentation, in artificial delivery, by turning, or the forceps; for embryulsio, and the Cæsarean operation; and for the extraction of retained or adherent placentæ. In obstetric operations the influence is deepened, but in ordinary parturition it is not given so fully, pain being

annulled without inducing insensibility. Dr. Rigby, of London, states that a woman in labour will remark:—"I know I have a pain, but yet I do not feel it;" and Dr. Bowman, of this city, mentioned to me an interesting case, where the lady eagerly requested a repetition of the inhalation, because "it smothered the pains." This latter gentleman has also mentioned to me its value as an emmenagogue.

It is also invaluable to the military surgeon, in cases of malingering; and to the medical jurist, in the detection of feigned diseases. It enables the surgeon to make examinations and explorations for the purposes of diagnosis, that could not possibly be otherwise effected. It facilitates for him, too, the reduction of dislocations and of hernia, the replacement of hæmorrhoids, prolapsus ani, catheterism through an otherwise impermeable stricture, extension of contracted joints, *et multa alia*, whilst it opens a wider field for the exercise of conservative surgery, and permits the most formidable and protracted operations to be undertaken.

The duty of administering chloroform by inhalation should not be entrusted to tyros or non-professional persons. It is safe and judicious only in the hands of an accomplished chloroformist—who

cannot become so by mere intuition, but by that tact which experience engenders, based upon a profound knowledge of its physiological action, by which alone can be obviated "a tendency to death." During operations, it should be his sole duty, and engross his whole attention. He should neither aid the surgeon, nor should the attention of the surgeon be distracted by watching the effects of the anæsthetic. Chloroform is an agent powerful for good, but, in the hands of the inexperienced and incapable, equally so for evil; when so administered, the wonder is, not so much that fatal cases sometimes occur, as that they should not be the rule instead of the exception.

There are certain conditions essential to successful anæsthesia—both antecedent to, and during its introduction—by which unpleasant effects may be readily avoided, and regarding which the chloroformist should give clear and precise instructions. No solid food must be taken before the operation, as nausea and vomiting will result, interrupting the progress of inhalation, delaying the operation, rendering the patient filthy and uncomfortable, and disgusting the attendants. The patient should not, however, be kept fasting; a little wine beaten up with an egg, or beef-tea, should be taken two or

three hours before ; and if in this interval he has undergone any exhausting occupation, the egg and wine, or beef-tea and wine, may be administered a short time prior to the commencement of inhalation. The vapour of chloroform, when inhaled, enters the lungs, and is absorbed by the pulmonary mucous surface. Thence it passes directly into the circulation, and with such rapidity, that the ulterior effect of the anæsthetic cannot be escaped, inasmuch as there is no time, volatile though it be, for its secretion. Dr. Snow calculated its effect to occur as soon as the blood has taken up 1-56th part of the amount it is capable of dissolving.

Whatever means or apparatus may be adopted, precautions should be taken so to dispose them as to permit the free access of atmospheric air.

Chloroform is a narcotico-irritant when inhaled ; and narcotism, by its agency, should be insidiously induced. To procure insensibility in a very rapid manner might excite a dangerous degree of narcotism. It should not be applied so closely to the face, at first, as to create gulping and choking by its pungency ; but as the respiratory organs become habituated to its action, it should be gradually approached, so as to be inhaled by both mouth and nostrils ; then follow whirring sounds in the ears,

and a sensation of vibratory thrilling and benumbing throughout the body; rapid loss of sensation, motion, and lastly, of consciousness, succeed. Just before consciousness is entirely suspended, the patient often instinctively tries to rid himself of the vapour by turning his face rapidly from side to side, and snatching at the vehicle adapted for its administration. This, of course, must be prevented, by following the movements of the face, and controlling his hands. The vapour at first exhilarates, and may occasion slight struggling, and incoherent expressions; but by proceeding noiselessly and firmly, the patient is soon subdued, and narcotism is induced. At first, the pulse is accelerated by 10 or 20 beats in the minute, but afterwards it falls to its normal standard; and if the vapour be long and fully exhibited, still further diminishes in frequency. The voluntary muscles become relaxed, although some assert that they are thrown into a rigid, cataleptic condition, or are generally contracted; but these phenomena can only occur prior to the complete induction of anæsthesia. The pupils may be natural, slightly contracted, or dilated; generally turned upwards, but occasionally downwards; strabismus has never been observed. The tests of the patient being sufficiently and fully

anæsthetized are—induced slowness of the pulse, some degree of noise or stertor in the respiration, and no flinching or winking on touching the inner edge of the eyelids or eyeball. Immediately this state occurs the vapour ought to be withdrawn. The knife must never be applied, no incision made, until these indications are completed. The vapour of chloroform should be administered gradually, but freely and fully; the stage of excitement cut short, and rendered as brief as is consistent with safety; otherwise, small doses only are given, which but exhilarate in the same manner as the nitrous oxide, or “laughing gas.”

Dr. Headland has divided its action into three stages :—

1. Some alteration in the feelings of the patient.
2. Inebriation; the mind and volition being impaired, but consciousness remaining.
3. Unconsciousness; anæsthesia.

If the operation occupies a short time, the chloroform need not be re-applied; when protracted, a few inspirations every half-minute or so is requisite, pausing, however, for some sign of sensibility before its repetition.

The late Dr. Snow, whose elaborate researches have reduced the administration of the vapour of

chloroform to a system, instead of a mere matter of hap-hazard, divided the narcotism induced by its inhalation into different *degrees*, preferring this term to *stages*, inasmuch as the slighter degrees of narcotism occur at the later stages of the process, during the recovery of the patient as well as at the commencement. Of these degrees there are five, which glide insensibly into each other. The first includes all the effects that exist whilst the patient retains consciousness, and to which allusion has already been made, viz., tingling, tinnitus aurium, &c.

Consciousness is retained longest by persons of cultivated mind, whilst the illiterate, and those who are lowest in the scale of intelligence, get into a "rowdy" condition almost immediately. In this degree, there is often considerable anæsthesia—diminution of common sensibility. As the effects of inhalation subside, and consciousness returns, we have a recurrence of the first degree, with even a greater amount of anæsthesia, so that sutures can be made, and the smarting of the wound obviated for some time.

During the second degree, the mental functions are impaired. The patient appears asleep, but on raising one eyelid the other will open, and the eyes move consentaneously, and in a voluntary manner.

It is, at this time, the pungency of the vapour appears to cause annoyance, the object of the inhalation being forgotten. So much anæsthesia accompanies this degree, that it is unnecessary to proceed beyond it in midwifery, or in operations upon children. Although necessary to induce a greater amount of narcotism in adults, before commencing an operation, if protracted, the patient is generally, during the greater part of the time, in this, the second degree.

Proceeding to the third degree, all voluntary motions are suspended; the eyes are inclined upwards, the pupils somewhat contracted, and the conjunctivæ considerably injected. There is no perception or consciousness of pain, the best test of which is the loss of sensibility of the conjunctivæ, —previously alluded to.

Arrived at the *fourth* degree, it is indicated by stertorous breathing, dilated pupils, relaxed muscles, and total insensibility. It is seldom necessary to proceed as far as this, except in the reduction of dislocations of long standing, or dissection in the neighbourhood of important vessels and nerves.

The *fifth* degree includes the embarrassment and cessation of the breathing.

Dr. Snow demonstrates the narcotic action of

the vapour of chloroform to be on the peripheral extremities of the nerves, as well as on the nervous centres. It circulates through the entire body, in all parts of which it can be chemically detected. Its local effect is greatest when it has had time to permeate through coats of vessels into the extravascular liquor sanguinis, where it comes into immediate contact with the ultimate nervous fibrillæ. After the greater part of the chloroform has escaped from the blood, during its passage through the lungs, some little time must elapse before that which is in the lymph external to the vessels can pass back again into them by endosmosis. Thus, we can understand how consciousness returns, and insensibility continues; for the brain is without lymph and lymphatics, all its blood being contained within vessels, through which, too, it circulates with greater velocity than in other parts of the body. The brain is thus freed from the effects of the vapour, whilst the nerves of sensation remain under its influence.

Narcotism, from inhalation of chloroform, has no effect upon the circulation, the pulse giving no indication of its amount or extent. As I have elsewhere stated, the pulse is usually increased in force and frequency at the commencement, but

when insensibility occurs, it diminishes until it regains its normal standard—beating with natural volume and force, however severe the operation. When the pulse becomes weaker and slower, Dr. Snow attributes it to the loss of blood, or the supervention of nausea.

Through the circulation, however, the influence of the vapour pervades every part of the nervous system, though with unequal action. According to M. Flourens, the nervous centres are affected in the following order, viz :—

1st. The cerebral hemispheres.

2nd. The cerebellum.

3rd. The spinal cord.

4th. The medulla oblongata.

5th. The ganglionic system.

As soon as the cerebral lobes are influenced, the intellect is suspended; when the cerebellum becomes involved, the power of regulating the muscular movements is lost; it pervades the spinal marrow, and sensitiveness and motion are in abeyance; extended to the medulla oblongata, life is forfeit; whilst the ganglionic system suffers last, and with it comes extinction of the functions of organic life.

Dr. Snow's experiments show that to induce what he recognises as the *third* degree of narcotism.

beyond which it is rarely necessary to be extended, 18 minims should be absorbed by an adult of average size and health. The induction of the fourth degree requires 24 minims, whilst 36 minims are needed to arrest the respiration. Apparently, much more than this is administered in practice ; but it is not absorbed, being thrown out again when it has reached the trachea, mouth, and nostrils.

An adult usually remains conscious for from two to three minutes after the commencement of inhalation ; but this interval may be prolonged from nervous dread, or intolerance of the pungency of the vapour. It rarely takes more than seven or eight minutes to produce insensibility, and the patient usually becomes conscious within five minutes after the inhalation has been suspended. During the state of unconsciousness, no deglutition being expressed, the saliva accumulates, and probably there is an increased excretion of it, rendering it necessary to guard against the sudden ejection of it, upon the person of the chloroformist. It is important not to talk or address the patient whilst recovering. Sickness occasionally follows, but it usually subsides within an hour, and, for that period, it is better to avoid giving food, drink, or

medicine. Much loss of blood, however, during an operation will necessitate the imbibition of brandy and water; in fact, faintness and depression must be treated on ordinary principles.

It cannot be denied that there is danger pertaining to the administration of chloroform, but the advantages derived from it are so great as to render the proportionate risk insignificant. All narcotics are dangerous in their employment, and capable of inducing a fatal result, and chloroformization is but carrying the effects of a narcotic further than previous usage sanctioned, or had discovered. Accidents, therefore, cannot fail to happen with chloroform, unless it is carefully and systematically administered, and for this reason it should never be entrusted to the careless and inexperienced. Dr. Snow's experiments show that atmospheric air when saturated with the vapour of chloroform, contains of such vapour at 60° Fah., 12, and at 70°, 19 per centum. He also demonstrates that 8 or 10 per cent. of the vapour in the inspired air is capable of causing sudden death, by paralysing the heart. But such risk is obviated, as air dangerously charged is too pungent to breathe, and whether the temperature be 60° or 70°, the air is far from being saturated, by the

surface it passes over, in the usual modes of inhalation. A knowledge of these laws, which regulate the action of heat, shows, too, that the temperature must be considerably reduced, as the chloroform changes its condition from liquid to vapour. Dr. Snow narrates the history of some fifty fatal cases, with their symptoms and mode of death. As far as they are reported, no measure had been taken to regulate the proportion of vapour in the respired air, and in no case did death occur, as it does when the vapour of chloroform does not exceed 5 per cent. in the inspired air.

Chloroform has the power of causing death without previous insensibility—the French call it *sideration*—and death takes place from cardiac syncope, or arrest of the heart's action. Cardiac differs from ordinary or anæmic syncope, or syncope from mental emotion. In these last, the cavities of the heart are empty, and the lungs fall; but, in the first, the right cavities are always full, whether the syncope depends on paralysis by the narcotic, inherent weakness of the structure of the heart, or its being overpowered by the quantity of blood with which it is distended. The lungs, too, are more or less congested, their appearance being very much the same as in asphyxia, by privation of

air, which also ends in a species of cardiac syncope, the stoppage being due to the over-distension of the right cavities, and structural loss of power, from no oxygenated blood being supplied through the coronary arteries.

The first duty, then, of the chloroformist is to dilate the vapours with atmospheric air, so far that it cannot cause sudden death without timely warning of impending danger; the next is to watch carefully the symptoms that arise, as the patient passes from one degree to another. Snow advises the admixture of chloroform with an equal proportion of spirits of wine, and directs, that as nearly all the spirit remains behind, to change the handkerchief or sponge for a dry one, during a protracted operation. But I agree with Professor Simpson, and last, not least, my friend, Dr. Bowman, that the best diluent is atmospheric air.

Let us, however, suppose animation suspended, ere there are any means to which we can have recourse, to restore vitality. Dashing cold water can be of no service, inasmuch as the skin remains insensible. The same remarks do not apply, however, to the usual resort of ammonia to the nostrils, for Dr. Marshall Hall alleged that it actually neutralised the carbonic poison in the pulmonary

blood. No harm results from them certainly, save occupying time, which is too valuable to lose even a moment. Artificial respiration must be had recourse to promptly, and this either by mouth to mouth insufflation, or Marshall Hall's postural method. Every case that has been restored has been by these means. In addition, as the right cavities of the heart are distended, one of the jugular veins should be opened, if the artificial respiration does not immediately restore the patient.

A fatal case occurred some short time ago, in the hands of Dr. Motherwell, but I am not acquainted with the symptoms induced, or measures adopted, further than the newspaper reports. Still the proportion of deaths directly from chloroform is very insignificant. The total population of the United Kingdom of Great Britain and Ireland, of the United States, France, and Germany is estimated at 120,000,000. These countries are selected, because from them the deaths are reported. The number of capital operations performed in surgery, derivable from hospital statistics, and therefore exclusive of the upper classes, is reported to have been 1,200,000. Out of these, 74 deaths have occurred from anæsthetic agents, viz., 68 from chloroform, 2 from ether, 1 from a mixture of ether

and chloroform, 1 from a mixture of chloroform and alcohol, and 2 from amylene. No death has occurred from its administration in midwifery.* Surely, then, the surgeon is not warranted in withholding so inestimable a boon; and I have no hesitation in charging that man with inhumanity and gross dereliction of duty, who wantonly subjects suffering humanity to the knife without its aid. I have heard surgeons of eminence here object to its employment, because the operation was deemed by them not sufficiently serious, or was to be performed on the mouth, or on the score of not being sufficiently remunerated, &c. I shall be able, however, to show that there are few cases indeed, if any, where it is inadmissible. Especially, too, we must bear in mind that chloroform leaves the system so speedily, that if death occurs after consciousness has returned, it cannot be attributable to the chloroform.† Death, then, from the narcotic action of chloroform, takes place by paralysis of the heart. The ganglionic system only being affected in the fifth degree of narcotism, and the

* The cases of Dr. Ramsbotham and Mr. Gream are no evidence. I have been favoured by Dr. Bowman with two amusing instances of Dr. R.'s early prejudices.

† FERGUSSON.

heart being under the influence of that system, it is more distantly impressible than the brain and nerves of respiration; these last being affected in the fourth degree, when the narcotizing influence extends to the medulla oblongata. All the narcotic inhaled must pass through the left cavities of the heart; if slowly, no harm results, but if the blood be too highly charged with the vapour, its nerves are paralysed at once. In proof of this, are the experiments of Snow, Sibson, Wakley, and the Commission which reported to the Society of Emulation in Paris, in 1855. The pulse, then, must be carefully and continuously watched; and so, if accident cannot be prevented, by its immediate warning, life may be saved.

Many cases have been suggested as producing a fatal result. Amongst these, age; but it has been administered to babes of 8 and 10 days old, as well as old men at 70 years, and, indeed, one case at 90. The youngest patient who has died from chloroform was about 8 years, the oldest 65—being the only death above 60. The greatest proportion of recorded deaths has occurred between the ages of 35 and 45.

Chloroform acts most favourably on children, and its effects need not be advanced beyond the

second degree. From their quicker breathing and circulation, the influence is produced and subsides more rapidly. Dr. Bowman administered it, during one of my operations, on a baby of a few months, for the removal of two large nævi, which necessarily occupied from twenty to thirty minutes. It was immediately followed by a natural sleep of long duration; and this is usually the case with very young children, who have been kept for any length of time in a state of insensibility. No alarm, therefore, need be experienced at the non-restoration of consciousness. The tranquil breathing and normal pulse are sufficiently indicative, and the child will probably sleep so for some hours.

In persons of advanced years, who have been subjected to the influence of chloroform, the effects subside more slowly, from the slower circulation.

No counter-indications to the employment of anæsthetics are offered by the conditions of strength or debility. The more feeble the subject, the more quietly does he become insensible, thus approximating to the condition that children exhibit.

An objection has been urged to its use in persons subject to hysteria. There certainly is sometimes an accession of hysterical symptoms, but they disappear by quietly proceeding with the narcotism.

If deep, violent breathing accompanies the hysteria, however, it must be administered sparingly, or even withdrawn for a minute or two. Even if an epileptic seizure occurs, it needs only to be continued.

Anæsthesia from chloroform may be induced at all periods of pregnancy; there is no objection to it during menstruation; diseases of the lungs present no obstacle, although some little difficulty and delay is occasionally caused by exciting cough; in affections of the heart it is absolutely serviceable, by keeping its action at the normal rate; and it affects insane people as others. It has been alleged that hard-drinkers are not susceptible, but this is simply one of those hearsays originally propagated by false "a priori" reasoning.

Much stress has been laid upon idiosyncrasy determining a fatal result, but in eleven out of fifty recorded cases of death, chloroform had been inhaled without any unusual effect. So also with respect to fear, it does not militate against the safety and success of chloroformization.

Various instruments and apparatus have been devised for the administration of chloroform; their object being to regulate the amount of its vapour, in due proportion to the respired air. The best of these are the balloon or bladder; Snow's, Sibson's,

and Charriere's inhalers ; Duroy's anæsthesimeter ; and Armstrong Todd's instruments, made by Fergusson of Giltspur Street, consisting of a perforated cylinder, piston, and mouth-piece. Before employing any of these, it is requisite to study their peculiarities thoroughly. A hollow, conical sponge, with a hole at the apex, is frequently adopted ; but it is objectionable, as the slightest grasping pressure ejects the chloroform, with which it is moistened, upon the patient's skin, and produces smarting and irritation. At present, I am inclined to prefer the handkerchief, on account of its freely permitting the admixture of air. Dr. Bowman has a very ingenious way of folding a table-napkin, somewhat in the shape of a bishop's mitre, and gradually approaching it to the face, until the mouth and nostrils are occluded.

As regards the quantity of chloroform employed, that in itself is unimportant, if due care be taken of its sufficient dilution with atmospheric air, prior to inhalation. The late Dr. Snow recommended its previous admixture with an equal quantity of spirits of wine ; but I can perceive no advantage derivable from that, inasmuch as the chloroform is more vaporizable, and a handkerchief becomes so saturated during a protracted operation, as to

require being repeatedly changed for a dry one. One chloroformist invariably gives a wine-glassful of spirits of wine to his patients, ladies as well, before exhibiting the anæsthetic.

The combination of ether with chloroform is also undesirable, inasmuch as ether is six times more volatile; so that, at the commencement, the more pungent vapour is inhaled, and lastly, the strongest.

To continue its effects, about thirty drops must be occasionally re-sprinkled, but repetition is to be judged of by its effects, not regulated by quantity.

No tolerance of the narcotic is established by its long continued use, that is, the dose does not require increasing.

The superinduction of anæsthesia by chloroform has been alleged to be difficult or impossible in some persons; but none are proof against its full influence, if efficiently administered. Excitement and jactitation may alarm the inexperienced; but to the accomplished chloroformist they have no signification, further than to indicate that the vapour is inhaled too slowly, or in too small a quantity.

I have already alluded to the allegations of indecencies set forth by Dr. Gream and others, as being emanations from weak and impure minds;

and this need excite no surprise, as the same prejudice was once urged against potatoes, as an edible.*

M. Chassaignac has called attention to the anti-hæmorrhagic power of chloroform—effected by the normal condition of the circulation and respiration during its sedative action; this sedation diminishing the number, force, and impulse of the heart's pulsations, and also that condition of blood, which is the cause of venous hæmorrhage. Secondary hæmorrhages, too, are less frequent, as the operator has leisure to secure the deligation of bleeding arteries efficiently.

Chloroform has almost entirely superseded ether, its advantages being that a much less quantity is required; its action is more rapid, perfect, and persistent; the exhilarating stage is shorter; the time of the operator is economised; its inhalation and influence are more agreeable; its odour is more evanescent; and no special instrument is needed for its exhibition.

The employment of chloroform has immensely extended the domain of surgery. Operations, for instance, for necrosis, are now undertaken, however tedious or extensive; and they are of the

* Chambers's "Traditions."

most successful, the most conservative character—relieving very painful affections, without mutilation.

An opinion prevails that chloroform cannot be safely used in operations upon the mouth, fauces, or jaws—espeeially the upper, (and this was, at one time, the opinion of Syme and Lizars) as the blood would be liable to flow into the lungs. Dr. Snow's experiments on eats, show that the glottis retains some sensibility as long as the creature is eapable of breathing. A good deal of blood may pass into the stomaeh; but if a few drops enter the trachea they are eoughed up again, as in the waking state, unless the influence is too deep, or has been too long eontinued. Attention must be given in such operations to the position of the patient, so as to faeilitate the gravitation of the blood, externally. In the removal of eonsiderable portions of the upper jaw, that I have previously narrated, Dr. Bowman retained the patient under the full influence of the anæsthetic for a period of about one hour and a-quarter, not only with perfect safety, but without the slightest embarrassment or interference with the necessary and tedious steps of the operation; and without oceasioning me the slightest anxiety, to distraet my attention, by the condition of the patient either becoming conscious or lapsing

into danger. Dr. Bowman informs me that he has since administered it, in the practice of a dentist in this city, two days successively to the same lady, for periods of three hours, on account of protracted operations on the teeth, without any difficulty or risk, and with the disadvantage of the supine position.

Mr. Haynes Walton considers, with respect to operations on the eye, that no well-founded objection exists to the exhibition of chloroform; except for extraction of cataract, or division of the cornea to a like extent, for any other purpose—and the risk is from extrusion of contents, by efforts during subsequent vomiting which may ensue.

We have then ample evidence of the inestimable value of chloroform as an anæsthetic, during operations, both to the surgeon and his patient. Certain precautions are necessary, as regards its employment, antecedent to an operation, during the performance of it, and subsequently.

1. The patient should eat no solid food during the day prior to its inhalation.
2. Beef tea and a little wine may be taken two hours previously.
3. A handkerchief, table napkin, or sponge preferable to inhaling apparatus.

4. The best diluent is atmospheric air.

5. It should be quietly breathed, and the napkin gradually approached until the mouth and nostrils are occluded.

6. The quantity to be inhaled must be judged of by the effects, so also its repetition.

7. The respiration and pulse must be continuously watched.

8. Strict silence must be enjoined.

9. The signal for the employment of the knife must not be given until insensibility is induced.

10. The test of insensibility is the absence of winking on touching the eyeball.

11. When consciousness is returning, after the cessation of the inhalation, the patient should not be addressed or replied to.

12. If the pulse falters, withdraw the handkerchief and admit the free access of air.

13. If the pulsation ceases, vapour of sal volatile to the nostrils, artificial respiration, and opening a jugular vein.

14. If vomiting ensues, a little brandy with water, or soda-water; if obstinate, opium.

15. The chloroformist must give his whole and undivided attention to the exhibition of the anæsthetic.

Such then is a *resumé* of the indications required

during chloroformization; but, as I have already premised, there is no royal road to its safe and successful acquirement—we cannot become chloroformists by intuition. Inhumanity still lingers in the profession, amongst some surgeons, whose crude notions tenaciously adhere to the belief that extensive mutilations constitute surgery.

These loppers of limbs, these disjointers, have as great a horror of chloroform as the fabled St. Nicholas of “holy water.” Others, again, are deterred from its employment by the attendant risks, and the distraction of their attention from the steps of the operation. I have myself experienced this embarrassment, until I had the assistance of so accomplished a chloroformist as Dr. Bowman; to whom, I am indebted for much valuable information on this subject, derived from his acquaintance both with Professor Simpson and the late Dr. Snow, as well as his personal experiments and experience. With Dr. Bowman’s assistance, I would confidently undertake the most protracted and formidable operation; and I trust other members of the profession will be induced to give their attention to this subject, and consider that safe and judicious anæsthesia is not the least important element to advance the science of surgery.

I may mention, in conclusion, that chloroform has met with many surgeons antagonistic to its administration in *gun-shot wounds*; but the prejudices of these gentlemen may easily be met by an appeal to the results of surgical operations performed in the Crimea during the war. Anæsthesia was resorted to in the majority of cases operated on, from the period of the battle of the Alma until the close of the siege operations before Sebastopol, with only *two* fatal results; one of which was caused by the patient not having been placed in the recumbent position, and the other from inhaling an impure chloroform. Dr. Bowen* has detected both free chlorine and muriatic acid in different samples of chloroform supplied to the hospital at Plymouth; hence the necessity of obtaining *pure chloroform*.

* Intimated at a meeting of the Army Medical Society in the Crimea, 1856.

FINIS.